Third Five-Year Review Report

for

Baird & McGuire Superfund Site

Holbrook

Norfolk County, Massachusetts

September 2009

PREPARED BY:

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Region 1
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Approved by:

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Date:

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LIST OF ACRONYMS AND ABBREVIATIONS

ACRONYM	DEFINITION
AAL	Ambient Air Level
ARAR	Applicable or Relevant and Appropriate Requirement
AUL	Activity and Use Limitation
AWQC	Ambient Water Quality Criteria
BOH	Board of Health
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act, 42 USC § 9601 et seq.
CFR	Code of Federal Regulations
COC	Contaminant of Concern
COPC	Contaminant of Potential Concern
CWA	Clean Water Act
DEM	Department of Environmental Management
DEQE	Massachusetts Department of Environmental Quality Engineering
DOT	Department of Transportation
EO	Executive Order
EPA	Environmental Protection Agency (U.S. EPA - Region 1)
ERA	Ecological Risk Assessment
ERED	Environmental Residue Effects Database
ESD	Explanation of Significant Differences
EW	Extraction Well
FDA	U.S. Food and Drug Administration
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act of 1947
FS	Feasibility Study
GAC	Granular Activated Carbon
GWTF	Groundwater Treatment Facility

ACRONYM	DEFINITION
HQ	Hazard Quotient
ICs	Institutional Controls
IS	Incineration and Stabilization
LNAPL	Light Non-Aqueous Phase Liquid
LOAEL	Lowest Observed Adverse Effects Level
LTRA	Long-term Response Action
M&E	Metcalf & Eddy
MassDEP	Massachusetts Department of Environmental Protection
MCLs	Maximum Contaminant Levels
MEPA	Massachusetts Environmental Policy Act
MGD	Million Gallons Per Day
MNA	Monitored Natural Attenuation
NCP	National Contingency Plan, 40 CFR Part 300
NOAA	National Oceanic and Atmospheric Administration
NOAEL	No Adverse Effects Levels
NPL	National Priority List
O&M	Operation and Maintenance
OMEE	Ontario Ministry of Environment and Energy
OU-1	Operable Unit 1
OU-2	Operable Unit 2
OU-3	Operable Unit 3
OU-4	Operable Unit 4
PAHs	Polycyclic Aromatic Hydrocarbons
PLC	Programmable Logic Controller
PRP	potentially responsible party
RAC	Response Action Contract
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act, 42 U.S.C. §§ 6901 *et seq.*
RfD	Reference Dose
RI	Remedial Investigation
ROD	Record of Decision
RSE	Remedial System Evaluation
SCADA	Supervisory Control and Data Acquisition
SDWA	Safe Drinking Water Act
SF	Slope Factor
SQC	Sediment Quality Criteria
SVOCs	Semivolatile Organic Compounds

ACRONYM	DEFINITION
TBC	To Be Considered
TLV	Threshold Limit Value
TRV	Toxicity Reference Value
UCL	Upper Concentration Limit
USACE	United States Army Corps of Engineers
VOCs	Volatile Organic Compounds

EXECUTIVE SUMMARY

This five-year review report was prepared for the Baird & McGuire Superfund Site located on South Street in Holbrook, Massachusetts. The 1986 ROD defines the Site as the area within the EPA security fence constructed in July 1985, which includes approximately 32.5 acres. The Site is not limited to land within the Baird & McGuire property, as it also includes five privately owned lots and two lots co-owned by the towns of Holbrook and Randolph. The site impacts several ecological features including the Cochato River, an unnamed brook, the 100-year floodplain, and wetland areas.

Site contamination occurred during the operations of a chemical manufacturing company (Baird & McGuire) from 1912 to 1983, that produced herbicides, pesticides, disinfectants, soaps, floor waxes and solvents. Waste disposal methods at the site included direct discharge into the soil, a nearby brook and wetlands, a former gravel pit in the eastern portion of the site, and underground disposal systems. Volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polycyclic aromatic hydrocarbons (PAHs), pesticides, and heavy metals including lead and arsenic are the contaminants of concern in site soils, sediment, and groundwater. Additionally, an LNAPL plume has been determined to be the primary source of contamination in groundwater.

The EPA issued three RODs for the site that included four selected operable units. The first ROD, issued in September 1986, specified groundwater extraction and treatment at an on-site treatment plant (OU-1) and soil excavation and treatment at an on-site incinerator (OU-2). The second ROD, issued in September 1989, addressed contamination in the Cochato River sediments (OU-3). EPA issued the final ROD in 1990, which called for reopening the Donna Road well field to replace the lost supply resulting from contamination of the South Street municipal wellfield (OU-4).

The construction of the GWTF (OU-1) was completed in 1991. Treatment of contaminated groundwater is ongoing. Treated water recharges to the groundwater through four infiltration basins. The source control remedy to remove and treat contaminated soils (OU-2) was completed in July 1997. The removal and treatment of contaminated sediments from the Cochato River (OU-3) was completed in June 1995. In 2000, EPA provided funding to assist the towns of Holbrook and Randolph in expanding the existing water supply capacity at the Upper Reservoir/Great Pond. An Explanation of Significant Difference (ESD) document was issued in August 2003 for OU-4 stating that, due to expansion of the water capacity in the Upper Reservoir/Great Pond provided via a second ESD document for OU-1, also issued in August 2003, the reactivation of the Donna Road wellfield was determined to be not necessary. Consequently, no further action will be taken on OU-4.

Until June 2004, EPA was responsible for GWTF operation and maintenance; groundwater, surface water, sediment, fish and wetland monitoring; and evaluation of long term protectiveness of the remedies and the need for institutional controls (ICs). In June 2004, the Massachusetts Department of Environmental Protection (MassDEP) assumed responsibility for the Site. In 2005, EPA issued an ESD to incorporate comprehensive institutional controls into the OU1 and OU2 remedies.

For the past five years, MassDEP, through their contractor, has operated and maintained the GWTF and conducted groundwater monitoring. No sediment or wetlands monitoring has been conducted during this period. It was reported by the MassDEP project manager that surface water sampling was conducted by the Massachusetts Office of Watershed Management, however, the details of and results from this sampling were not available for the five year review. A review of the O&M activities and data indicate that the GWTF is fully functional and protective of site groundwater. Many facility upgrades have improved its performance, however, due to the age of the facility, equipment repair and replacement is an

ongoing issue. Additional upgrades are planned for the near future, such as optimizing the extraction well system to increase efficiency.

A review of groundwater data collected over the past five years indicates the following:

- Contamination in the groundwater at the site is diminishing. The plume of organic contamination has decreased. Some metals, such as arsenic, remain in the groundwater in high concentrations.

This is the third five-year review for the Site. The first five-year review was completed in September 1999, and the second five-year review was completed in September 2004, which was the trigger for this third review. The five-year review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure.

This five-year review concluded that the remedy is functioning as designed and continues to be protective of human health and the environment. However, in order to ensure that long-term cleanup goals are being attained, sediment and fish tissue sampling are essential. In addition, for the remedy to remain protective in the long term, comprehensive institutional controls must be implemented.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: Baird & McGuire		
EPA ID *(from WasteLAN)*: MAD001041987		
Region: I	**State:** MA	**City/County:** Holbrook/Norfolk

SITE STATUS	
NPL status: ☒ Final ☐ Deleted ☐ Other (specify)	
Remediation status (choose all that apply): ☐ Under Construction ☒ Operating ☐ Complete	
Multiple OUs?* ☒ YES ☐ NO	**Construction completion date:** _8_ / _21 / _2003_
Has site been put into reuse? ☐ YES ☒ NO	

REVIEW STATUS	
Lead agency: ☒ EPA ☐ State ☐ Tribe ☐ Other Federal Agency	
Author name: Elaine Stanley	
Author title: Remedial Project Manager	**Author affiliation:** EPA Region I
Review period:** 9/28/2004 to 9/28/2009	
Date(s) of site inspection: 6/23/09	

Type of review:
☒ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only
☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead
☐ Regional Discretion

Review number: ☐ 1 (first) ☐ 2 (second) ☒ 3 (third) ☐ Other (specify)

Triggering action:
☐ Actual RA Onsite Construction at OU #____ ☐ Actual RA Start at OU#____
☐ Construction Completion ☒ Previous Five-Year Review Report
☐ Other (specify)

Triggering action date *(from WasteLAN)*: 9/30/2004

Due date *(five years after triggering action date)*: 9/30/2009

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form, cont'd.

Issues:

(1) Groundwater at the site contains concentrations of VOCs, SVOCs, metals, and pesticides above action limits. The groundwater is currently treated to concentrations below the action limits.

(3) During the last five year review, sediment along the river contained PAHs above action limits. No additional data has been collected during the past 5 years.

(4) During the last five year review, fish tissue contained PAHs at concentrations above action limits; however fish contamination may not all be site-related. Warning signs provide a degree of current protectiveness.

(5) Institutional Controls are not complete.

(6) Some areas of replicated wetlands are dominated by invasive species, primarily phragmites.

(1) Continue operating GWTF and groundwater monitoring. Re-evaluate presence and mobility of arsenic to determine if past conclusions are still valid and develop a plan to address remaining high concentrations, and evaluate LNAPL collection system.

(2) Monitor for natural attenuation parameters.

(3) Conduct biannual sediment monitoring; develop sediment monitoring plan.

(4) Conduct fish sampling once every five years; develop monitoring plan.

(5) Conduct on-site wetlands monitoring; develop monitoring plan.

(6) Complete the review and implementation of comprehensive institutional controls.

Protectiveness Statement(s):

Comprehensive Protectiveness Statement: Because all remedial actions at all OUs are protective, the site is protective of human health and the environment. The remedy currently protects human health and the environment because current exposure pathways are being controlled. All threats at the Site have been or are being addressed through groundwater treatment; removal, incineration, and stabilization of contaminated soil and ash; site fencing; warning signage; and expansion of an alternate water supply. However, for the Site to be protective in the long-term, it is important to complete the implementation of comprehensive institutional controls at the site to maintain a complete level of protectiveness for future activities in and around the site, and through continued monitoring of groundwater, sediment, and fish tissue.

It is essential that monitoring of these media continue in order to ensure that long-term cleanup goals are being met.

Other Comments: None.

SECTION 1.0
INTRODUCTION

This five-year review report is for the remedial actions conducted and on-going at the Baird & McGuire Superfund Site (the site) [Figures 1 and 2]. The purpose of this five-year review is to determine whether the remedies for the site are protective of human health and the environment. The methods, findings, and conclusions of this review are documented in this five-year review report. In addition, five-year review reports identify issues found during the review, if any, and present recommendations to address them.

EPA Region I has conducted this five-year review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan (NCP). Section 121(c) of CERCLA 42 USC § 9621(c) states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The Agency interpreted this requirement further in the NCP; 40 CFR §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

The Baird & McGuire site consists of four operable units. Operable Unit 1 (OU-1) refers to groundwater extraction and treatment. Operable Unit 2 (OU-2) refers to soil excavation and treatment at an on-site incinerator and on-site disposal. Operable Unit 3 (OU-3) was designated to address the contamination in the Cochato River sediments. Operable Unit 4 (OU-4) was designated for reopening the Donna Road well field to replace the lost supply resulting from contamination of the South Street well field.

This is the third five-year review for the Baird & McGuire Superfund Site. This review is required by statute because the selected remedy will, upon completion, leave hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure. The trigger for this statutory review is the signature date of the previous Five-Year Review report on September 30, 2004.

SECTION 2.0
SITE CHRONOLOGY

The chronology of the Site, including all significant site events and dates is included in Table 1.

Table 1: Chronology of Site Events	
Event	**Date**
Baird & McGuire Inc. operated a chemical mixing and batching company.	1912 – 1983
Commonwealth of Massachusetts becomes involved and fines the company at least thirty-five times for violations of the Federal Insecticide, Fungicide and Rodenticide Act of 1947(FIFRA).	1954 – 1977
Massachusetts Department of Environmental Quality Engineering (DEQE) (currently Department of Environmental Protection, or MassDEP) documents a number of questionable disposal practices.	1981 – 1982
Baird & McGuire Inc. carries out a number of voluntary remedial actions.	February - April, 1982
South Street municipal well field shut down.	1982
The Board of Selectmen of Holbrook revoke Baird & McGuire's permit to store chemicals at the Site and order the dismantling of existing storage facilities. As a result operations were terminated.	May 2, 1983
The Site is added to the National Priority List (NPL).	September 8, 1983
EPA begins removal actions including removing 1,000 cubic yards of contaminated soil, the constructing of a clay cap, installing a groundwater interception/recirculation system and erecting some fencing.	1983
EPA constructs a security fence to enclose the site.	July 1985
Remedial Investigation (RI) performed by GHR Engineering Associates.	May 1985
Feasibility Study (FS) performed by GHR Engineering Associates.	1986
EPA issues the first ROD which specifies groundwater extraction and treatment via an on-site treatment plant (OU-1) and soil excavation and treatment via an on-site incinerator (OU-2).	September 30, 1986
EPA issues the second ROD to address contamination in the Cochato River sediments (OU-3).	October 9, 1989

Table 1: Chronology of Site Events	
Event	**Date**
EPA issues the final ROD that calls for reopening the Donna Road well field to replace the lost supply resulting from contamination of the South Street wellfield (OU-4).	September 27, 1990
A groundwater treatment facility (GWTF) and extraction/recharge system is built (OU-1) and treatment of groundwater begins.	1991 to present
Removal of contaminated sediments from the Cochato River by the New England Division of the U.S. Army Corps of Engineers (OU-3).	May 1994 - June 1995
Source control remedy to remove and treat contaminated soils (OU-2) and on-site disposal of OU-2 soils and OU-3 sediments.	June 1995 - July 1997
LNAPL recovery system is constructed and becomes operational.	1998
Completion of the first Five-Year Review for the Site	September 1999
A Remedial System Evaluation (RSE) is completed for the GWTF.	January 2002
EPA signed two ESD documents for OU-1 and OU-4, allowing for partial funding of an off-site municipal water supply expansion project.	August 2003
MassDEP assumes site-wide O&M responsibility from EPA.	June 2004
Completion of the second Five-Year Review for the Site	September 2004
EPA issues an ESD for Institutional Controls	April 2005
MassDEP completed contractual agreement with Randolph/Holbrook Water District for alternate water supply capacity	June 2008
Completion of the Third Five-Year Review for the Site	September 2009

SECTION 3.0
BACKGROUND

3.1 PHYSICAL CHARACTERISTICS AND LAND AND RESOURCE USE

The Baird & McGuire Superfund Site is located on South Street in Holbrook, MA (Figure 1). The 1986 ROD defines the Site as the area within the EPA security fence constructed in July 1985. According to the FS, this fence encompasses all known areas of soil contamination related to Baird & McGuire (GHR, 1986a). The Site boundary and coincident fence line are shown on Figure 2, based on a Site survey conducted in May 1988. The Site designated on Figure 2 has been determined to consist of approximately 32.5 acres. For the purpose of increased security and access control measures during remedial actions, additional fencing was constructed in some areas beyond the Site boundary. This includes fencing around the groundwater treatment plant and recharge basins, and fencing beyond the southern Site boundary.

As illustrated on Figure 2, the Site is not limited to land within the former Baird & McGuire properties. Historically, Lots 130, 130-1 and 130-2 have had Baird & McGuire ownership. These lots consist of 9.33 acres, of which approximately 8 acres are within the Site boundaries. The remaining 24.5 acres of the Site consist of portions of five privately owned lots and two lots jointly owned by the towns of Holbrook and Randolph. In addition, four privately owned lots located west of the Cochato River (Lots 6, 12-2 and 12-3) have restricted access to the river due to the presence of the security fence.

Figure 2 also shows significant ecological Site features, including the Cochato River, the unnamed brook, the 100-year floodplain, and wetland areas. Based on a wetland boundary delineation conducted during RI investigations, wetlands occupied approximately 44 percent of the Site. In addition, 66 percent of the Site was determined to be within the 100-year floodplain (GHR, 1986a).

3.2 HISTORY OF CONTAMINATION

Baird & McGuire Inc. operated a chemical mixing and batching facility in northwest Holbrook, Massachusetts from 1912 to 1983. Manufactured products included herbicides, pesticides, disinfectants, soaps, floor waxes and solvents. Waste disposal methods at the site included direct discharge into the soil, a nearby brook and wetlands, and a former gravel pit in the eastern portion of the site. Underground disposal systems were also used.

The state became involved between 1954 and 1977 and fined the company at least thirty-five times for violations of the Federal Insecticide, Fungicide and Rodenticide Act of 1947 (FIFRA). In 1981 and 1982 the Massachusetts Department of Environmental Quality Engineering (DEQE) documented a number of questionable disposal practices. Baird & McGuire Inc. performed voluntary remedial actions from February to April of 1982. In May 1982, the Board of Selectmen of Holbrook revoked Baird & McGuire's permit to store chemicals at the Site and ordered that existing storage facilities be dismantled. As a result, operations were terminated.

3.3 INITIAL RESPONSE

A hydrological study was completed by EPA which initiated some removal actions in 1983. These actions included the removal of 1,020 cubic yards of contaminated soil, 1 ton of waste creosote, 25 gallons of waste coal tar, 155 pounds of solid hazardous waste and 47 drums of flammable liquids and solids, and 2

drums of corrosives. EPA also oversaw construction of a clay cap, installation of a groundwater interception-recirculation system, and erection of fencing. The Site was added to the National Priority List (NPL) on September 8, 1983. EPA constructed a security fence in July 1985 to enclose the Site.

An RI/FS (1985/1986a, GHR) identified and described the presence of a groundwater contamination plume, originating from the Baird & McGuire property and extending beyond the Cochato River. EPA issued three RODs for the Site, defining four operable units and describing selected remedial alternatives. The first ROD, issued in September 1986, specified groundwater extraction and treatment at an on-site treatment plant (OU-1) and soil excavation, treatment at an on-site incinerator, and disposal of ash on-site (OU-2). The second ROD, issued in September 1989, addressed contamination in the Cochato River sediments (OU-3). EPA issued the final ROD in 1990, which called for reopening the Donna Road well field to replace the lost supply resulting from contamination of the South Street wellfield (OU-4).

3.4 BASIS FOR TAKING ACTION AT THE SITE

The following summarizes the contaminants detected at the Site, as identified in the RI and during subsequent investigations.

Soil. Contaminants such as volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), other organic compounds, pesticides, dioxin, and heavy metals such as lead and arsenic have been detected in soils across the site. Dioxin also has been detected in area wetland soils. Although the Site was fenced off, both direct contact and accidental human ingestion of site soils posed an imminent threat to human health due to the high levels of pesticides and dioxin, as identified in the RI.

Groundwater. During the RI, VOCs, SVOCs, PAHs, pesticides, and metals (arsenic and lead) were detected in site groundwater and downgradient of the site, beyond the Cochato River. Direct contact or accidental ingestion of groundwater posed an imminent threat to public health. The contaminated groundwater resulted in the shut down of public wells (South Street well field). In a subsequent investigation, conducted by EPA in 1997, it was confirmed that light non-aqueous phase liquids (LNAPL) exist near the center of the plume. LNAPLs, undissolved chemicals that are less dense than water and thus float on top of the groundwater, have been determined to be a continuing source of contamination in groundwater at this site. Groundwater monitoring has continued to indicate the presence of VOCs, SVOCs, pesticides, solvents, arsenic and other inorganic chemicals.

Sediments. Contaminants of concern, detected in Cochato River and Unnamed Brook sediments at the site, include VOCs, PAHs, arsenic, and pesticides including DDT and chlordane. The concentrations detected were greatest in the portions of the river on Site and approximately 500 feet downgradient of the existing site fence. These sediments were determined to be acutely toxic to aquatic life (EPA, 1989); and were associated with an excess cancer risk level in excess of 1x10(-6).

These conclusions formed the basis of the selected remedies (past and present) for the Site as outlined in the RODs. See Section 4.0 for additional details.

SECTION 4.0
REMEDIAL ACTIONS

4.1 REMEDY SELECTION

EPA issued three RODs for the Site, defining four operable units and describing selected remedial alternatives. The first ROD, issued in September 1986, specified groundwater extraction and treatment via an on-site treatment plant (OU-1) and soil excavation and treatment via an on-site incinerator (OU-2). The second ROD, issued in September 1989, addressed contamination in the Cochato River sediments (OU-3). EPA issued the final ROD in 1990, which called for reopening the Donna Road well field to replace the lost supply resulting from contamination of the South Street wellfield (OU-4).

The following sections summarize the selected remedies for Operable Units 1, 2, 3, and 4.

4.1.1 Operable Unit 1

The remedial objectives for OU-1 groundwater are:

- Remediate the contaminated aquifer within a reasonable time period to prevent present or future impacts to groundwater drinking supplies;
- Protect surface waters from future contaminant migration; and
- Minimize long-term damage and/or maintenance requirements.

The selected remedial action for OU-1 includes the following components:

- Groundwater Extraction System;
- On-site Groundwater Treatment Facility; and
- Groundwater Recharge System.

The current system consists of eight extraction wells (EW-2, EW-3, EW-4A, EW-5, EW-6, EW-7, EW-8, and EW-9) that pump contaminated groundwater to a groundwater treatment facility, and four recharge basins for discharge of treated groundwater back to the aquifer. Extraction wells EW-1 and EW-4 are currently off-line. The groundwater extraction wells were located to contain the plume. The implementation of this system is described in Section 4.2.1.

4.1.2 Operable Unit 2

The remedial objectives for OU-2 (soil) were:

- Minimize the risk to the human population from direct contact with contaminated soils/sediments;
- Protect surface waters from future contaminant migration; and
- Minimize long-term damage and/or maintenance requirements.

Based on the nature and extent of soil contamination documented in the RI/FS, the 1986 ROD specified the excavation of soil from "hot areas" with subsequent treatment in an on-site incinerator, and on-site disposal of the treated soil (ash). The hot areas were delineated in the ROD based on contamination profiles developed in the RI Addendum (GHR, 1986b). The limits of excavation were established so that contaminant concentrations outside of the hot areas were one to two orders of magnitude lower than the concentrations inside the hot areas. Also considered was the presence of wetlands and the extent of contamination in those wetlands, with the intent of minimizing disruption to wetlands. The ROD notes that although this approach results in residual soil contamination, future health risk for a trespasser scenario would be within an acceptable range.

The selected remedial actions for OU-2 included the following components:

- Excavation with associated dewatering and erosion control;
- Backfilling using treated soil into the excavation area;
- Extraction Well Piping Relocation at the end of the excavation process;
- Temporary relocation of the Unnamed Stream during remediation followed by restoration of its natural course;
- On-Site Incineration and Stabilization (IS) Facility;
- Site Closure upon the completion of soil excavation and treatment;
- Site Restoration;
- Wetlands Restoration; and
- Continued Monitoring.

4.1.3 Operable Unit 3

The remedial objectives for OU-3 (sediment in river) were:

- Reduce human exposure to arsenic, DDT, PAHs, and chlordane in sediment by excavating to an average depth of six (6) inches and by achieving the following levels of contaminants: 250 ppm for arsenic; 19 ppm for DDT; 5 ppm for chlordane; and 22 ppm for total PAHs. These concentrations correspond to a 1×10^{-5} to 1×10^{-6} excess cancer risk level; and
- Reduce environmental exposure to those contaminants of concern to concentrations corresponding to the mean sediment quality criteria (SQC) (EPA, 1989) in the river bed, and to the upper bound SQC in the wetland area north of Ice Pond.

The ROD specified excavation and incineration of approximately 1,500 cubic yards of contaminated sediments for protection of public health and the environment. Sediments were to be excavated to an average depth of six inches from approximately the center of the fenced Site area downstream to Union

Street. Sediments were to be transported to the on-site treatment facility, implemented under OU-2, and subsequently placed as backfill on the Site.

The ROD also required erosion control, wetlands restoration, placement of organic fill in the excavated areas of the river in the vicinity of the groundwater plume and long-term monitoring of downstream portions of the river where sediments were not excavated.

To minimize the disruption of wetlands, sediments were not to be removed from areas of the river where contaminant concentrations were low, calculated risks were low, and no impacts were observed. In accordance with the ROD for OU-3, long term monitoring is to be conducted to evaluate remaining contaminant levels and their behavior over time (EPA, 1989).

4.1.4 Operable Unit 4

The remedial objectives for OU-4 were:

- To identify a candidate water source to replace the 0.31 million gallons per day (MGD) lost supply from the closing of the South Street municipal well field in an environmentally sound, cost effective manner without placing additional stress on the Great Pond Reservoir system or existing water treatment facilities.

The selected remedy for OU-4 consisted of the following components:

- Permitting/Pre-design Studies;
- Groundwater Extraction;
- Groundwater treatment; and
- Delivery to the Distribution System.

On August 21, 2003, an Explanation of Significant Differences document (ESD) was issued for the groundwater remedy (OU-1) specified in the 1986 ROD. The ROD was changed to include excavation of soil from the Upper Reservoir/Great Pond located in Braintree and Randolph (approximately 400,000 cubic yards) to provide an additional storage capacity resulting in an estimated additional supply of 0.31 MGD to be used in the interim to supplement the community's drinking water until the groundwater remedial action is complete. On this date, EPA also issued an ESD document for OU-4 stating that no further action will be taken under this ROD.

4.2 REMEDY IMPLEMENTATION

This section presents summaries of the remedial actions conducted or being conducted at the site in accordance with the RODs' objectives mentioned in Section 4.1.

4.2.1 OU-1 Remedy Implementation

The groundwater remedy at the Site is ongoing. A groundwater treatment facility (GWTF) and extraction/recharge system were built in 1991 and remain in operation, with modifications.

The three main components of the groundwater remedy are extraction, on-site treatment, and recharge as specified by the 1986 ROD.

Groundwater Extraction. The groundwater extraction system consists of eight extraction wells (EW 2, EW-3, EW-4A, EW-5, EW-6, EW-7, EW-8, and EW-9). Operation of EW-2 was discontinued in 2006. The remaining wells operate at flow rates ranging from less than 1 to 21 gpm (Clean Harbors, 2009). Well EW-9 has not operated properly since installation, producing a very low (<1 gpm) flow rate. The extraction well locations are shown on Figure 3. The system was originally designed to pump at a maximum total rate of 200 gpm. During the period of July 2006 to September 2007, the system pumped an average of 87 gpm. The wells pump the groundwater via separate pipes to an extraction well control building, located south of the extraction system, where the water converges to a single header pipe that conveys the water to the GWTF. All extraction system controls (e.g., valves, flow meters, electrical switches) are housed within the extraction system control building. The wells are operated remotely through use of a programmable logic controller (PLC) located at the GWTF.

Figure 3 also shows the locations of the numerous monitoring wells that exist at the Site. At many of the monitored locations, multiple wells have been constructed. These well clusters allow water levels and water quality to be determined at different depths in the stratified drift deposits, in the till deposits and weathered bedrock zone, and in the underlying fractured bedrock. Data gathered from the monitoring wells are used both to develop groundwater contour maps from which the area of capture of the extraction well system can be inferred, and to monitor the improvements in water quality resulting from groundwater extraction and treatment.

LNAPL Collection. As an enhancement to the groundwater extraction and treatment systems, LNAPL is pumped directly from 3 wells (EW-8, MW-97-1, and MW-98-1) to a separate collection tank. The recovered LNAPL is disposed off-site. Until June, 2004, the LNAPL was mixed with an absorbent, crushed corncobs, prior to off-site disposal. The State is currently shipping the LNAPL off-site in liquid form. The LNAPL system is currently operated intermittently, when dissolved phase is noted to be presented.

Groundwater Treatment. The Groundwater Treatment Facility (GWTF) is located off South Street as shown on Figure 3. All unit operations are contained in the same building including:

- Metals pretreatment consisting of potassium permanganate to remove heavy metals and arsenic, and the addition of polymer to enhance iron removal;
- Filtration for removing suspended solids carried over from the metals removal process;
- Granular activated carbon (GAC) adsorption for removing organic compounds;
- Sludge dewatering used for decreasing the water content of the metals hydroxide sludge;
- Metals hydroxide sludge disposal in a RCRA hazardous waste landfill; and
- Vapor phase carbon adsorption for treating off-gases from various tanks.

Monitoring points throughout the system allow for in-line instruments to measure flow and indicator parameters, and allow for the collection of samples for off-site laboratory analyses. The GWTF operation is currently staffed 10 hours a day, 7 days per week. Groundwater is treated to meet the SDWA MCLs.

Groundwater Recharge System. Treated water from the GWTF is recharged back to the groundwater through four infiltration basins (each 100 feet by 100 feet). Water is discharged to one basin at a time

while the other three basins remain inactive. Discharge is rotated on a weekly basis to other basins to prevent overuse of any one basin and allow maintenance of a particular basin if recharge capacity is diminished.

4.2.2 OU-2 Remedy Implementation

The selected remedy for OU-2 consisted of soil excavation and incineration, erosion control, dewatering, backfilling of incinerated material, relocation of the unnamed stream, site restoration, wetlands restoration and monitoring.

This source control remedy (removal and treatment of contaminated soils) commenced in June 1995 and was completed in July 1997. All soils excavation and treatment facilities have been decommissioned and removed. To summarize, the OU-2 remedial activities consisted of:

- Approximately 248,000 tons of soil and sediment were excavated and treated by on-site incineration. Soils were excavated to approximately one foot below the seasonal low water table within the excavation limits, with excavation depths ranging from approximately 3 to 33 feet below grade;
- Approximately 250,000 tons of the treated soil (i.e., ash) were backfilled into the 12.5-acre excavation area;
- TCLP tests were performed on the ash, and approximately 320 tons of ash which failed the leaching criteria were stabilized with cement prior to backfilling to reduce the potential for leaching of contaminants;
- The incinerator building and equipment were demobilized and removed from the site and the incinerator building foundation was crushed and buried on-site; and
- Approximately 7.4 acres of forested and scrub/shrub floodplain wetlands underwent on-site restoration, including a small peat bog and 1,000 linear feet of the unnamed brook.

EPA and M&E concluded from the site visit conducted for the first five-year review that, although the wetland was not restored with the organic soils recommended in the Final Restoration Plan, the mitigative measures required by EPA and USACE were met. Initially, the wetland was monitored annually in order to assess the success of the wetland restoration effort. During the site visit on June 23, 2009, it appeared that the restored wetland was well established and in good condition.

4.2.3 OU-3 Remedy Implementation

The remedy for OU-3 involved removal of contaminated sediments from the Cochato River. This remedy commenced in May 1994 and was completed in June 1995. Major components of the sediment remedy were site preparation, sediment dredging, placement of organic fill and monitoring.

In preparation for river excavation, the river banks were cleared and grubbed. A detention basin was built in the river just downstream of the Union Street bridge to trap suspended sediments during dredging and was subsequently removed. Temporary haul roads were constructed and then removed after testing showed no residual contamination. Sediments were dredged from a 2,100-foot reach of river extending from the Baird & McGuire Site to the Union Street bridge. Sediments were dredged to a minimum depth of six inches and a maximum depth of 24 inches in some areas. Dredged material was placed in sealable containers and transported to the Baird & McGuire exclusion zone where it was stored for subsequent

incineration. A total of 4,712 cubic yards of material were removed from the river. Dredged material was transported to the IS facility, incinerated and placed as backfill within the OU-2 soil excavation area. Wetlands adversely impacted by the dredging and the installation of haul roads were restored under the OU-2 Final Restoration Plan.

The portion of the river where contaminated groundwater underlies the riverbed was backfilled with approximately 438 cubic yards of clean organic fill. This organic fill acts as a filter which will attenuate contaminated groundwater that may discharge into the river.

Following completion of the remedy, EPA implemented a long term monitoring plan of the Cochato River downstream of the dredged area including analyses of sediment and fish. The plan includes collection and analysis of sediment samples annually for the first five years and fish samples every 5 years, followed by a review of the data and trends. Sediment samples were last collected in 2002.

4.2.4 OU-4 Remedy Implementation

The ROD for OU-4 was issued to address alternate water supply/replacement of lost supply that resulted from the contamination and subsequent shutdown of the South Street well field, which was part of the water supply for Holbrook in 1982. The reactivation of the Donna Road well field was selected as the alternate water supply.

In 2001, EPA provided funding to MassDEP through a Cooperative Agreement to assist the towns of Holbrook and Randolph in expanding existing water capacity at the Upper Reservoir/Great Pond. MassDEP actually provided the funding (along with its 10% RA cost share) for the project to the local water board through a contract. This was addressed in an ESD document in August 2003 for the groundwater remedy (OU-1). EPA believes the increase in additional drinking water capacity of the Upper Reservoir/Great Pond as provided by the ESD document for OU-1, should be sufficient to eliminate any interim risk until interim cleanup levels are met for the groundwater remedy. As a result, the reactivation of the Donna Road wellfield was determined to be not necessary. Thus, an ESD document was issued on August 21, 2003 for OU-4, which states that EPA will not implement the selected OU-4 remedy and no further action will be taken under OU-4.

4.3 OPERATION AND MAINTENANCE

The majority of O&M activities at the site include the operations of the GWTF (OU-1). For OU-1, O&M activities include the operation and maintenance of the GWTF, including the groundwater extraction wells, and the LNAPL collection system, and monitoring well sampling and analyses. Operating the GWTF currently requires a staff of three to operate the facility 10 hours per day and provide routine and periodic mechanical maintenance, equipment inspections, and monitoring of the process and data (chemical analyses, flows, vessel pressures). Periodic monitoring activities include sample collection from plant monitoring points, monitoring wells, and extraction wells.

More specifically, operating the GWTF includes the addition of treatment chemicals such as polymer and potassium permanganate used for groundwater treatment, change out of filter media such as activated carbon and filter sand, collecting samples from the process for laboratory analyses, disposal of residuals (sludge), and the collection and disposal of LNAPL.

LNAPL is collected from 3 wells and pumped into a tank in a separate building. The tank is periodically pumped out for off-site disposal of the LNAPL. During the past 5 years, little dissolved phase liquid has

been observed entering the LNAPL collection system, therefore, the system has been operated intermittently. Other disposal activities include the disposal of sludge from the metals removal process. The sludge is transported off-site in roll-off containers for disposal.

Typical routine maintenance items include gear lubrication, seal replacement, and pipe cleaning. Due to the age of the facility, a good amount of non-routine maintenance involving repairing or replacing worn-out or outdated equipment is also required. Other O&M activities include maintaining site security, such as fence repair, and general site maintenance such as mowing and snow removal as needed.

The O&M of the site is documented in daily and weekly quality control reports, which are compiled and included in an annual O&M report (CHES, 2005; CHES, 2007; CHES, 2009) and in monthly progress summary reports, which are included as an Appendix of the annual Evaluation of Groundwater Remediation Progress Annual Report – OU1 (SAIC, 2006; SAIC, 2007; CHES, 2008). The elements of the daily and weekly reports include a summary of GWTF status, flow rates and gallons treated and discharged, a description of maintenance and inspections performed, identification of issues and corrective actions, and identification of monitoring performed. The annual O&M reports include information on overall facility performance, plant influent and effluent analytical results, and figures depicting contaminant trends for GWTF influent and effluent data, and plant upgrades and modifications. Elements of the monthly report include a summary of overall facility performance, monitoring information for the extraction wells, process control summary information (average pH, turbidity, and temperature), treatment process information, and a summary of analytical data for the process, including contaminant removal efficiency. Measuring and meeting discharge criteria is key in determining the facility's performance.

Problems associated with the O&M of the site include typical mechanical and process issues that are addressed as needed. In the past 5 years, the most significant issues have included the need to repair or replace the aging equipment. In addition, there has been a continual decline in the groundwater extraction system pumping rate due to several factors, including the removal of EW-2 from operation and various operational issues with the remaining wells. These items are additionally discussed in Section 5.0.

Contaminant removal rates for VOCs, SVOCs, metals, and pesticides have continued to exceed 99% removal. GWTF effluent concentrations meet or exceed the discharge criteria for these compounds.

Past O&M activities have included periodic monitoring of soils and wetlands (OU- 2) and monitoring of sediment and fish in the Cochato River (OU- 3). No data has been collected for these operable units over the past five years and, at this time, the State has not submitted any monitoring plans for these operable units.

A summary of historic GWTF O&M costs are listed below:

Fiscal Year	Costs of O&M*
2005	$1.04 million
2006	$1.06 million
2007	$1.10 million
2008	$1.06 million
2009	$1.06 million
*The costs shown include all work conducted at the site, including routine O&M and all upgrades made to the GWTF.	

SECTION 5.0
PROGRESS SINCE LAST FIVE-YEAR REVIEW

This is the third five year review for the Site. This section presents the recommendations and follow-up actions identified in the second five year review, followed by a summary of efforts since 2004 to address the recommendations. In addition, this section includes a summary of other site activities and studies that have been conducted since 2004 to enhance the OU1 site remedy, including a number of upgrades to the GWTF.

5.1 PROTECTIVENESS STATEMENT AND RECOMMENDATIONS FROM SECOND FIVE YEAR REVIEW

The following protectiveness statement was included in the second five-year review:

The remedy is expected to be protective of human health and the environment upon attainment of groundwater cleanup goals, through continued operation of the GWTF, and sediment cleanup goals, through natural degrading, depositional, and dispersive processes. In the interim, exposure pathways that could result in unacceptable risks are being controlled. All threats at the Site have been addressed through groundwater treatment; removal, incineration, and stabilization of contaminated soil and ash; site fencing; and expansion of an alternate water supply.

Long-term protectiveness of the remedial action will be verified by continued monitoring of groundwater, sediment, and fish tissue. However, the State has no monitoring plans in place for MNA, sediments, wetlands, and fish tissue.

Issues and recommendations from the second five year review included:

Issue #1: Groundwater at the site contains contaminants above action limits.
Recommendation: Continue operation of the GWTF

Issue #2: Sediments along the river contain concentrations of contaminants above action limits.
Recommendation: Continue monitoring program; continue operation of the GWTF; maintain site fencing.

Issue #3: Some sections of replicated wetlands do not appear to be receiving sufficient water; presence of non-native and invasive plants is increasing.
Recommendation: Perform additional monitoring to evaluate whether invasive plants require control; monitor groundwater levels; inspect gabion, spreader, and levee structures.

Issue #4: Fish tissue contains PAHs above action limits.
Recommendation: Continue monitoring program; maintain warning signs.

Issue #5: Institutional controls are not complete.
Recommendation: Complete the review and implementation of comprehensive institutional controls.

5.2 PROGRESS SINCE LAST FIVE YEAR REVIEW

Progress made on the recommendations listed above is summarized as follows:

Progress on issue #1: The GWTF has continued to operate, and has continued to achieve greater than 99% contaminant removal; however, there has been a continual decline in the extraction system flowrate due to a number of operational issues. The extraction wells were redeveloped in 2006 to remove sand and bacteria from the well screens in an attempt to improve flowrate, however, EW-2 could not be rehabilitated and was removed from service at that time. EW-9 has not produced sufficient flow since its installation and will likely be replaced. A number of mechanical and electrical repairs have been required on the remaining well pumps, which has resulted in downtime for those wells. A number of upgrades to the GWTF have been implemented within the last 5 years. These are summarized on Table 2. Concentrations of VOCs and SVOCs in Site groundwater have continued to decrease. Concentrations of arsenic in Site groundwater have decreased in some areas of the site, but have exhibited no increasing or decreasing trend in others.

Progress on issue #2: The GWTF has continued to operate. Site fencing has been maintained and repairs made as needed. Since the last five year review, however, no additional sediment monitoring has been conducted.

Progress on issue #3: During the five year review site inspection, it was observed that the wetland vegetation appeared to be well established and wetland hydrology appeared to be sufficient to support the wetland plant communities present. Although some invasive plant species were still present, others were being controlled by the presence of insects (larvae of the Galerucella beetle) released in Massachusetts as part of a biological control program.

Progress on issue #4: Although warning signs are being maintained, no additional fish tissue monitoring has been conducted

Progress on issue #5: In 2005 EPA completed an evaluation of institutional controls for the 11 parcels of land on and abutting the Site, and issued an ESD to incorporate comprehensive institutional controls into the OU1 and OU2 remedies. The institutional controls have not yet been implemented.

In addition to the recommendations identified in the last five year review, a number of upgrades have been made to the GWTF. Generally, MassDEP has taken a four phase approach to upgrading the GWTF since they took over the remedy in 2004. Phase 1 included repairs that were needed immediately to address worn-out equipment. Phase 2 included upgrades to improve plant safety. Phase 3 included upgrades aimed at improving equipment and energy efficiency. Phase 4, which is ongoing, includes optimizing extraction system efficiency and replacing poorly performing extraction well EW-9, conducting a site-wide arsenic investigation, optimizing GAC performance, and upgrading plant heating equipment, possibly by using a groundwater source heat pump.

The site progress is described below for each operable unit, with additional details relating to groundwater treatment improvements and evaluations summarized in Table 2. More details on repairs and improvements made during the past five years are provided in the annual O&M reports (CHES, 2005; CHES, 2007; CHES, 2009).

Table 2: Summary of GWTF Improvements (OU-1) and Process Evaluations	
1. Summary of GWTF System Improvements	
Extraction System	The extraction wells were redeveloped to improve their efficiency. (One well, EW-2, could not be redeveloped and was removed from service, and another, EW-9, continues to produce poorly despite redevelopment.) In addition, modifications were made to the SCADA system to improve communication with the extraction well pumps, flow balancing, and to provide information on extraction system performance.
LNAPL extraction	
System Controls	SCADA system upgrades, which were initiated during the previous 5 year period, have been continued and refined to maximize system operation and to minimize potential system malfunctions. Modifications have allowed for a reduction in the number of staff required to operate the facility, from 4 to 3. Specific details of SCADA system improvements are provided in the annual O&M reports.
GWTF:	
Metals removal	Replaced worn out mixers. There have been no other changes to the metals removal system.
Biotreatment	The biounits (activated sludge tanks) have not performed as activated sludge tanks. Instead, they have been used for aeration purposes and as settling tanks behind the metals removal process. During this review period, Unit B was emptied, accumulated sludge was removed, and the unit was thoroughly inspected. Repairs were made to address corrosion on tank sidewalls.
Filtration	To provide additional coarse filtration capability upstream of the GAC units, removable filter screen baskets were installed on the filter feed tank discharge line. In addition, two pilot studies, including a bag filter pilot study and a greensand filter study, were conducted to determine whether use of these filters could improve operation. It was determined that greensand would not provide sufficient benefits to justify the cost.
GAC	The GAC vessel backwash system was modified to use treated effluent rather than untreated filter feed water for backwashing. This modification provides a higher velocity backwash and results in increased carbon life.
VGAC	No changes.
Sludge dewatering	Maintenance was performed to replace the sludge feed line from the sludge pumps to the filter press. No process changes were made.
Sludge disposal	No changes.
Discharge basins	No changes
Process Monitoring / Laboratory	Reductions in the quantity and frequency of sample analyses were made to reduce costs, while still conducting monitoring necessary for permit compliance and process control.

Table 2: Summary of GWTF Improvements (OU-1) and Process Evaluations	
Site Safety Upgrades	Installed new gate entry and building security system which eliminated the need for full-time site security officers; installed safety cage on the Bio-clarifier stairs and tie-offs for fall protection above the interior of the bio-clarifiers, exterior roof ladder security, carbon monoxide detector, and fire and police lock box; modified the cover to T-1; and made various electrical modifications and upgrades.
Energy Efficiency Upgrades	Replaced lighting in GWTF with more energy efficient fixtures; replaced pump motors with more energy efficient variable frequency drive (VFD) motors.
2. Summary of O&M Studies and Evaluations	
Energy Efficiency Study	A study to identify and prioritize energy efficiency and related facility improvements was conducted by SAIC for MassDEP (SAIC, 2005). A number of recommendations were made, many of which have been implemented (see above).
Greensand Filter pilot test	A pilot study was performed to determine the feasibility of using greensand media in lieu of sand/gravel filtration media as a means of improving both filtration and metals removal performance. After review of the data, it was determined that this media would not provide sufficient benefits to justify the cost of implementation.
Carbon emissions and energy efficiency study	EPA and MassDEP conducted a study to assess the carbon dioxide emissions associated with site energy use, inefficient operation of the GAC units, and the potential use of Combined Heat and Power (CHP) and groundwater source heat pump technology. The findings indicated that CHP and GWS heat pump use were possible, though first, if possible, operation of the existing GAC units should be improved. The reconfiguration of flow through the clarifier from series to parallel was recommended. Findings were presented in a CLU-IN seminar entitled "Tackling the Carbon Footprint at Pump and Treat Projects: A Case for Energy Efficiency", March 10, 2009.

SECTION 6.0
FIVE-YEAR REVIEW PROCESS

This section describes the activities performed during the five-year review process and provides a summary of findings.

6.1 COMMUNITY NOTIFICATION AND INVOLVEMENT

Over the past five years, notifications to the public have included a Citizens' Task Force Meeting, and communication with the public when inquiries are made.

During the past five years, one Community Task Force meeting was held, during which MassDEP provided an update on the progress of groundwater remediation since the transfer of operation and maintenance from EPA to DEP. MassDEP contacted the Citizen's Task Force about a second meeting, but there was no apparent interest, so no additional meeting was held.

In addition, MassDEP responded to inquiries from a Holbrook selectman about a discharge to the river and a complaint about noise. MassDEP personnel invited the selectman to the facility to show her where the plant discharges, and that the discharge to the river was not from the GWTF. The selectman was satisfied that neither the discharge nor the noise was associated with the Baird & McGuire Site.

6.2 DOCUMENT REVIEW

This five-year review consisted of a review of relevant documents for the Site. See Attachment 2 for a list of documents that were reviewed.

6.3 DATA REVIEW

6.3.1 Treatment Plant Effluent Monitoring

The effluent from the groundwater treatment plant is monitored on a monthly basis to observe contaminant removal efficiencies. Note that the most current data was collected in 2007.

On every occasion over the period from October 3, 2004 to October 7, 2007, the final effluent contained no detectable concentrations of SVOCs or pesticides, indicating greater than 99.99% removal. There were no detectable concentrations of VOC with MCLs in the effluent during this period, however several VOCs (including MTBE, acetone, butanone, isopropylbenzene and naphthalene) were detected at low concentrations on occasions between June 7, 2006 and February 11, 2007. Overall, VOC removal efficiency was greater than 99.99%. Influent concentrations during this period ranged from 343 to 810 µg/l for total VOCs; 307 to 1,324 µg/l for total SVOCs; and nondetect to 1.35 µg/l for total pesticides.

Concentrations of arsenic in effluent samples were nondetect on all but three occasions during the period from October 3, 2004 to October 28, 2007. The arsenic concentration from one sample, collected on February 4, 2007, slightly exceeded the MCL (10 µg/l), at a concentration of 11.7 µg/l; and was below the MCL on the other two occasions (8.0 µg/l on January 28, 2007; and 9.0 µg/l on July 8, 2007). Iron was not detected in any effluent samples. Turbidity readings exceeded the project action limit of 5 NTU on several occasions during the month of June 2007. The monthly process reports for May and June 2007 (CHES, 2008) indicated that increased turbidity levels in plant effluent were likely due to operational activities, including draining Bio Clarifier B. The monthly average turbidity level was less than 1 NTU for the remainder of the months in this period. Turbidity is not a primary drinking water contaminant.

6.3.2 Groundwater Monitoring

Summary. Groundwater extraction wells at the site are sampled on a quarterly basis. An annual round of groundwater monitoring, including 18 monitoring wells and extraction wells EW-3 through EW-9, is conducted by the GWTF operator. From 2000 through 2003, most of the site monitoring wells were sampled annually with prior monitoring events occurring in 1988 (pre-extraction system), 1994 (2 events), 1995 (2 events), 1997, and 1998. Groundwater samples are currently analyzed for VOCs, SVOCs, pesticides, arsenic, and wet chemistry parameters. Historical groundwater monitoring results for total VOCs, SVOCs, and arsenic are included in Attachment 4.

Annual evaluations of extraction system performance in regard to contaminated groundwater remediation and containment have been performed and are included, along with the results of quarterly and annual groundwater sampling for this five year period, in annual Evaluation of Groundwater Remediation Progress reports (SAIC, 2005; SAIC, 2006; SAIC, 2007; CHES, 2008). These reports include discussion of extraction well and monitoring well analytical results, tabular presentation of all data, a figure depicting the approximate extent of arsenic contamination, and an estimate of contaminant mass removal over the reporting period, as well as a discussion of treatment system operation. Annual reports prior to 2004 also included contour maps ("plume maps") of total VOCs and SVOCs in overburden and bedrock for a comprehensive round of groundwater sampling performed by the GWTF operator. The 1997 and 1998 plume maps were included in the first five-year review report (M&E, 1999). Plume maps for 2000, 2001, 2002, and 2003 are documented in annual reports entitled *Evaluation of Groundwater Remediation Progress at the Baird & McGuire Superfund Site* (M&E, 2001, 2002, 2003, and 2004a). Additionally, graphs showing contaminant concentrations over time for select monitoring wells are presented in a report entitled *Trend Evaluation Report for the Baird & McGuire Superfund Site* (M&E, 2004b).

Plume maps for 2007 arsenic, VOC, and SVOC data were developed as part of this five year review in order to depict the magnitude and location of remaining contamination. The plume maps are located in Attachment 3. Note that due to the limited number of monitoring locations compared to historical, comprehensive monitoring rounds, the extent of each plume shown on these two figures may appear to be greater than the actual extent. Locations which were previously non-detects are no longer sampled, but were not assumed to be non-detect during current plume figure development. Therefore, locations which previously bounded the plume may no longer be included in the data set.

The following table shows compounds which were detected in the 2007 comprehensive sampling round at concentrations above the MCLs. Only the exceedances from the most recent sampling round are presented.

Table 3. Groundwater MCL Exceedances in 2007

Contaminant	Location	SDWA MCL (µg/l)	Concentration (µg/l) in 2007
Benzene	EW-8	5	6.4
Ethylbenzene	EW-8	700	1,480
bis(2-Ethylhexyl)phthalate	M-9T	6	7.85
bis(2-Ethylhexyl)phthalate	MW-97-32	6	8.23
Pentachlorophenol	EW-3	1	3.16/ND (FD)
Heptachlor epoxide	BM-31B	0.2	0.6/ND (FD)
Lindane (gamma-BHC)	EW-8	0.2	0.332
Arsenic	Seven overburden monitoring wells and all extraction wells	10	12 - 1,760

ND - Not detected
FD - Field duplicate result

VOCs and SVOCs. Total VOC and SVOC concentrations over time for Site groundwater are provided in Table A4-1 of Attachment 4. It should be noted that several site wells were replaced after being destroyed by source control remediation. The original well name and the replacement well name are listed in Table A4-1 for clarity. The 2004 trend evaluation report concluded that significant decreasing trends in VOC and SVOC concentrations exist for the majority of overburden and bedrock wells monitored at the Site. The data collected since the previous Five-year Review report support this conclusion. VOC and SVOC concentrations in monitoring wells on the east side of the Cochato River have primarily been nondetect or very low, indicating that continued migration of the plume beneath and beyond the river is not occurring. As shown in Table 3, benzene, ethylbenzene, bis(2-ethylhexyl)phthalate, and pentachlorophenol (PCP) were detected above current MCLs in overburden groundwater in 2007. Plume maps depicting SVOC and VOC contamination based on the 2007 data are included in Attachment 3. In 2006, PCP and tetrachloroethene (PCE) were detected above the MCL in overburden groundwater. During each of the years for which data were available, naphthalene was detected in the highest concentrations, with maximum naphthalene concentrations detected in extraction well EW-8. In 2005, naphthalene concentrations in EW-8 ranged from 2,900 to 5,760 µg/l. In 2006, naphthalene concentrations in EW-8 ranged from 2,900 to 3,800 µg/l. In 2007, naphthalene was detected in EW-8 at a concentration of 4,000 µg/l.

Metals. Arsenic has generally been detected in the majority of overburden wells within the plume and surrounding areas. Within the plume area, overburden wells have not exhibited consistent increasing or decreasing trends. Historical arsenic concentrations are provided in Table A4-2 of Attachment 4. As shown in Table 3, arsenic was detected above the current SDWA MCL of 10 µg/l at all of the extraction wells sampled and at seven other overburden monitoring wells across the site in 2007. The highest concentration was detected in monitoring well BM-31B, at a concentration of 1.76 mg/l. In the annual reports, results are compared to the ROD (1986) MCL of 50 µg/l. Arsenic exceeded the 1989 MCL in three of the 13 monitoring wells and all of the extraction wells sampled in 2007; and five of the monitoring

wells sampled and all of the extraction wells sampled in 2005 and 2006. A plume map depicting arsenic contamination based on the 2007 data is included in Attachment 3. Monitoring for iron in the extraction and monitoring wells was eliminated in 2005. Until that time, it was detected at concentrations above the secondary MCL in groundwater (0.3 mg/L) in all of the extraction wells and in most of the monitoring wells. As described in the most recent Groundwater Evaluation Report for the site (M&E, 2004a), the aquifer is in a reduced state, and therefore arsenic is soluble and mobile. The extraction system is containing the arsenic plume along with the organic plume by removing the dissolved phase plume.

An in-depth evaluation of arsenic presence and mobility at Baird & McGuire was presented in the 2000 Evaluation of Remediation Progress at the Baird & McGuire Site (M&E, 2001). The report discussed nature, extent, fate and transport of arsenic at the site. It was based on data collected during excavation, incineration and placement of soils during the source control remedy and on groundwater monitoring results, from samples collected in 2000. The observations and conclusions from that report are as follows:

1. Elevated arsenic concentrations at the Baird & McGuire site have been detected in groundwater (i.e., dissolved phase). The highest concentrations [at the time of the evaluation] were found near LNAPL sources.

2. The likely arsenic sources are: LNAPL product containing arsenic, contaminated soils in the aquifer, backfilled ash above or just below the water table, and background arsenic concentrations.

3. The aquifer is in a reduced state as evidenced by arsenic in the dissolved phase.

4. There is no evidence that arsenic concentrations are increasing or that the plume is spreading. In fact, the concentrations have remained somewhat stable over time. This is likely due to slow dissolution from LNAPL and release from iron oxides as a result of iron reduction. As long as the LNAPL and dissolved organic contamination remain, arsenic concentrations in groundwater will likely remain stable.

5. Arsenic in groundwater is being removed and contained by the extraction system. As long as significant organic contaminants exist, the aquifer will remain in the reduced state, and arsenic will be mobile and continue to be removed. Once the organic contamination is removed and the aquifer returns to an oxidized state, the arsenic will likely become adsorbed and/or precipitate and be much less mobile.

Dissolved oxygen data and ORP data collected at that time confirmed that the aquifer was in a reduced state, and it was concluded that once all organics are removed and the aquifer returns to an oxidized state, arsenic may become immobile in the aquifer. It is recommended that this issue be revisited to confirm or update this conclusion, and that a plan of action be developed to better address the high concentration of arsenic remaining in Site groundwater.

Pesticides. Since the last Five-year Review report, pesticides have generally remained at concentrations similar to historical results (see annual reports; SAIC, 2006; SAIC, 2007; CHES, 2008). There were three instances of higher than normal detections of pesticides in two different extraction wells, but the monitoring rounds following each instance showed concentrations returned to normal following these spikes. In October 2006, total pesticide concentration in EW-6 reached 98 µg/l, before dropping back down to 0.93 µg/l by August 2007. The other two increases in pesticide concentration were detected at EW-8. In December 2005, the concentration of total pesticides reached 25 µg/l, but dropped to 1.3 µg/l in

March 2006. Total pesticides in EW-8 also rose to 11 µg/l in August 2007, but subsequently dropped to 0.4 µg/l in September 2007.

LNAPL. During the period of October 1, 2006 through October 31, 2007, a total of 26 wells at the site were gauged on a monthly basis to evaluate the presence and thickness of LNAPL. The list of wells and gauging results for the reporting period are included in the Evaluation of Groundwater Remediation Progress Annual Report for this period (CHES, 2008). Measurable LNAPL was detected in five wells (MW97-28, EW-6, MW97-1, MW98-1, and EW-8) in July, August, and September, 2007. The maximum thickness of LNAPL was 0.45 foot, observed in extraction well EW-8 on July 27, 2007. All other measurable amounts of LNAPL for the reporting period ranged from 0.04 foot to 0.10 foot. Based on these measurements, it is likely that LNAPL continues to be a major source of dissolved contaminants in groundwater. A remediation system has been in place since March 1999 to remove LNAPL, however, it has been operated only intermittently during the last five years since the fluid entering the system has been in an emulsified state which is not readily separated by the system's oil/water separator (OWS). No measurable LNAPL has been collected since 2004 and no LNAPL was disposed of off-site.

During the previous five year review period (2000 – 2004), LNAPL samples were analyzed and were found to contain significant concentrations of the same contaminants found in the groundwater (i.e., iron, arsenic, VOCs, SVOCs, and pesticides) (M&E, 2004a). The location of LNAPL is coincident with the hot spot of the plume. Therefore, it was concluded that LNAPL is the primary source of the contaminants found in the groundwater. The groundwater evaluation reports for the site have concluded that, because a significant amount of pure phase product (LNAPL) still exists in groundwater at the site, biodegradation will have relatively little impact on contaminant destruction. If the LNAPL can be removed such that only the dissolved phase remains, biodegradation could be a significant factor in attaining cleanup goals. Biodegradation may be beneficial at the present time in stabilizing the edges of the plume away from the plume source, such as across the river and to the north of the extraction system. However, hydraulic containment achieved by the groundwater extraction system is likely the primary reason for the stable or shrinking plume size.

MNA Parameters. No monitoring was conducted for MNA parameters over the past five years. It is recommended that select overburden wells be sampled for natural attenuation (NA) parameters at a frequency of every five years until LNAPL thicknesses have dissipated to less than two inches, at which time, the frequency of sampling should be increased to every two years (see Attachment 5). The reasoning is that while there is evidence of biodegradation occurring (M&E, 2003a), it will have relatively little impact on contaminant destruction as long as a significant amount of pure phase product (LNAPL) still exists in the groundwater. If the LNAPL can be removed to the point that the source strength is significantly reduced, biodegradation could be a significant factor in attaining cleanup goals at the plume boundaries.

Conclusions. Overall, the data shows that the groundwater extraction system has been effective in containing the dissolved phase plumes and decreasing the concentrations of contaminants in groundwater. Groundwater contamination remains, however, and continued treatment is required to achieve state and federal drinking water standards, RCRA groundwater protection standards, and other federal and state groundwater protection standards. Constituents in Site groundwater still exceed interim cleanup criteria for arsenic, heptachlor epoxide, gamma-BHC, VOCs, and SVOCs. Identified as applicable or relevant and appropriate, the requirements under the Safe Drinking Water Act, RCRA Subpart F, Massachusetts Groundwater Quality Standards, and Massachusetts Drinking Water Requirements remain to be met. Groundwater requires continued remediation under these rules.

6.3.3 Cochato River Sediment, Surface Water, and Fish Tissue Monitoring

Long-term monitoring of sediments in the Cochato River was performed on an annual basis from 1996 to 2002. The OU-3 ROD called for long-term monitoring of sediments in portions of the Cochato River downstream of the portion of the Cochato River where sediments were excavated as part of the remedy. Long-term monitoring has also included analysis of fish tissue in order to monitor the impact of the sediments on the fish population. Fish sampling was conducted in 1992, 1996, and annually from 1999 through 2002. Surface water samples were collected from the Cochato River in 2000 in order to establish baseline surface water quality for the project.

Based on data trends identified from samples collected between 2000 and 2002, a sediment and fish tissue sampling frequency of every five years was recommended. Those recommendations are included in Attachment 5. No further surface water sampling was recommended (USEPA, 2004). No sediment or fish samples have been collected during the past five year period.

6.3.4 Wetland Monitoring

In the last five year review, it was recommended that an additional round of wetland monitoring be performed to evaluate whether purple loose strife has dominated the wetland and whether measures should be implemented to control it. It was also recommended that the gabion, spreader, and levee structures be inspected to identify any maintenance which should be performed to ensure its continued successful performance.

Wetland inspection has not been part of the MassDEP monitoring program over the past five years. However, as part of this five year review, a site inspection was performed on June 23, 2009, which included an inspection of the wetland. In general, wetland vegetation, particularly in the herbaceous layer, appeared to be establishing well. Species such as soft rush *(Juncus effusus)*, giant goldenrod *(Solidago gigantea)*, lurid sedge (*Carex lurida*), fox sedge *(Carex vulpinoidea)*, water horehound *(Lycopus americanus)*, Canada rush *(Juncus canadensis)*, deer-tongue grass *(Dichanthelium clandestinum)*, rough-stem goldenrod *(Solidago rugosa)*, wide-leaf cattail *(Typha latifolia)*, narrow-leaved cattail *(Typha angustifolia)*, sensitive fern *(Onoclea sensibilis)*, grass-leaf goldenrod *(Euthamia graminifolia)*, woolgrass *(Scirpus cyperinus)*, and poison ivy *(Toxicodendron radicans)*, among others, were present in the herbaceous layer. Silky dogwood *(Cornus amomum)*, Bebb willow (*Salix bebbiana*), red maple *(Acer rubrum)*, Northern arrowwood *(Viburnum dentatum)*, green ash *(Fraxinus pennsylvanica)*, speckled alder *(Alnus rugosa)*, highbush blueberry *(Vaccinium corymbosum)*, and grey birch (*Betula populifolia*) were observed in the shrub layer of the restored wetland areas at the site.

Restored upland portions of the site appeared to be well-vegetated and stabilized. Vegetation in these upland areas consisted of various grasses (Family: Poaceae), oxeye daisy *(Chrysanthemum leucanthemum)*, black locust (*Robinia pseudoacacia*), various goldenrods (*Solidago* spp.), common blackberry *(Rubus allegheniensis)*, white pine *(Pinus strobus)*, milkweed (*Asclepias* spp.) and Quaking aspen *(Populus tremuloides)*.

Wetland hydrology appeared to be sufficient to support the wetland plant communities present. Site staff indicated that the Cochato River occasionally overflows its banks, inundating portions of the wetland areas. At the time of the site visit, shallow standing water was

observed in portions of the wetlands closest to the river. At the time, the river was in the early stages of overflowing its bank such that the top of the bank was inundated. The gabion baskets, spreader and levee structures appeared to be functioning well at the time of observation, although they should be periodically checked and cleaned of debris.

Occasional patches of purple loosestrife were observed in the restored wetland areas. However, most of the purple loosestrife at the site showed varying degrees of insect herbivory which appeared to help reduce the overall level of purple loosestrife one would expect at the site, particularly in light of previous monitoring results. It appears that the insects observed are the larvae of the Galerucella beetle. This beetle, along with a couple of other species, has been released in Massachusetts as part of a biological control program for purple loosestrife. It appears that the beetles have found their way to the purple loosestrife onsite and are actively feeding on it.

Several wetland areas onsite were dominated by phragmites *(Phragmites australis)* and should be controlled by methods compatible with the site. Phragmites was the most widespread invasive species at the site. Other invasive species, such as glossy buckthorn *(Rhamnus frangula)* and reed canary grass *(Phalaris arundinacea)* were observed and should also be removed.

6.4 SITE INSPECTIONS

A site inspection of the groundwater treatment plant and replicated wetlands was performed on June 23, 2009. A completed site inspection form is attached. The following personnel were in attendance: Patrick Hurley of MassDEP; Maggie Delegorete, Chief Operator; Tom Touchet, Metcalf & Eddy; and Cinthia McLane, Metcalf & Eddy. Dorothy Allen of MassDEP was also onsite at the start of the site inspection.

6.5 INTERVIEWS

In accordance with EPA guidance for five-year reviews (EPA, 2001), several personnel involved with the operation and maintenance of the site were interviewed. The interviews took place on June 23, 2009. The interview forms are attached. Key points of discussion are provided in applicable sections of this report.

SECTION 7.0
TECHNICAL ASSESSMENT

This section discusses the technical assessment of the remedy and provides answers to the three questions posed in the EPA guidance for five-year reviews (EPA, 2001).

7.1 QUESTION A: IS THE REMEDY FUNCTIONING AS INTENDED BY THE DECISION DOCUMENTS?

Yes. The review of documents, ARARs, and risk assumptions indicates that the remedy was constructed in accordance with the ROD and ESDs and is currently protective.

7.2 QUESTION B: ARE THE EXPOSURE ASSUMPTIONS, TOXICITY DATA, CLEANUP LEVELS, AND REMEDIAL ACTION OBJECTIVES (RAOs) USED AT THE TIME OF REMEDY SELECTION STILL VALID?

Yes. Exposure assumptions and available toxicity information used at the time of remedy selection are still valid. Subsequent changes in toxicity values and risk assessment methods have occurred since remedy selection; however, these changes do not impact the protectiveness of the remedy.

7.2.1 Review of Human Health Risk Assessments and Toxicity Factors Serving as the Basis for the Remedy

The risk assessment performed for the 1986 Feasibility Study (FS) report (GHR, 1986a) concluded that there would be significant risk to human health if groundwater from the site containing VOCs, SVOCs, and metals was ingested in the future. The risk assessment further determined that trespasser exposures to site soil containing arsenic, chlordane, and dioxins exceeded EPA risk management guidelines. Direct contact recreational exposures to Cochato River sediments containing elevated levels of arsenic, DDT, PAHs, and chlordane also exceeded regulatory limits. MCLs were selected as interim cleanup levels for groundwater. The results of the risk assessment were used to determine the lateral and vertical limits of soil excavation, and to establish cleanup levels for sediment.

In 1997, a supplemental risk evaluation was performed by M&E as part of the Site Reuse Study (M&E, 1998) to determine the potential risk associated with future commercial/industrial site re-use. Child trespasser risks were also evaluated. Because soils had been excavated, incinerated, and backfilled on-site, the risk evaluation focused on residual risks associated with backfilled ash, contaminated soils remaining below the bottom depth of excavation, and 20 acres of soil remaining outside the limits of excavation. The study concluded that, based on the results of the qualitative risk evaluation, the site could be developed for commercial or industrial use and would not pose harm to children periodically trespassing onto the site.

In this five-year review report, the toxicity values that served as the basis for the sediment cleanup levels, as contained in the ROD, have been re-evaluated to determine whether any changes in toxicity impact the protectiveness of the remedy. Changes in toxicity values since the 1997 risk evaluation are also discussed to determine whether reuse decisions remain valid. Any changes in current or potential future exposure pathways or exposure assumptions that may impact remedy protectiveness are also noted. In addition, environmental data, available since the last five year review, have been qualitatively evaluated to determine whether exposure levels existing at the Site present a risk to current human receptors.

Changes in Toxicity

Table 4 presents a summary of the changes in toxicity values (oral reference doses and oral cancer slope factors) for compounds selected as Contaminants of Potential Concern (COPCs) as identified in the 1989 risk assessment. Updated toxicity information was obtained from the *Integrated Risk Information System* (IRIS; EPA, 2004) and other current EPA sources (e.g., the Superfund Technical Support Center). Toxicity values for contaminants identified as COPCs during the 1997 risk evaluation, performed as part of the Site Reuse Study, have also been listed.

For most contaminants, changes to toxicity information have been minimal. Changes in toxicity values for groundwater COPCs (e.g., ethylbenzene, trichloroethene, tetrachloroethene, and vinyl chloride) would not affect remedy protectiveness since cleanup levels for groundwater are based on federal Maximum Contaminant Levels (MCLs). Once interim groundwater cleanup levels are achieved, an evaluation should be performed to demonstrate that the risk associated with potable groundwater use is within or below EPA's risk management guidelines. Until groundwater cleanup levels are achieved and groundwater use is demonstrated to not pose a risk to human health, the installation of private wells and associated groundwater exposure pathways should be prevented. Though no formal mechanism is yet in place to control groundwater use in the vicinity of the site, a local Board of Health (BOH) ordinance discourages groundwater use by requiring that property owners obtain BOH and Department of Public Works approval prior to installing wells.

A noteworthy change between 1997 and 2009 toxicity values is for chlordane, a significant contaminant in residual soils remaining at the site. The oral slope factor for chlordane has been decreased overall by a factor of approximately three, which results in a decrease in the estimation of cancer risk associated with chlordane in residual soil. Therefore, the conclusions of the 1997 risk evaluation remain valid, based on the toxicity evaluation.

TABLE 4: Comparison of 1989 and 2009 Oral Reference Doses and Oral Cancer Slope Factors for Compounds of Potential Concern

Contaminant of Potential Concern	Oral Reference Dose (RfD) (mg/kg-day)			Oral Slope Factor (SF) $(mg/kg\text{-}day)^{-1}$		
	1989	1997 [e]	2009	1989	1997 [e]	2009
1,1-Dichloroethene	N/A		0.05	1.16		N/A
1,2-Dichloroethane	N/A		0.02	0.092		0.091
2,3,7,8-TCDD (Dioxin)	1.00E-09 a		N/A	1.56E+05		1.3E+05
4,4'-DDD	N/A	N/A	N/A	0.34	0.24	0.24
4,4'-DDE	N/A		N/A	0.34		0.34
4,4'-DDT	N/A		0.0005	0.34		0.34

Contaminant of Potential Concern	Oral Reference Dose (RfD) (mg/kg-day)			Oral Slope Factor (SF) $(mg/kg\text{-}day)^{-1}$		
	1989	1997 [e]	2009	1989	1997 [e]	2009
Aldrin	N/A		0.00003	11.4		17
Arsenic	N/A	0.0003	0.0003	15	1.5	1.5
Benzene	N/A		0.004	0.029		0.055
Benzidene	N/A		0.003	234		230
Benzo(a)pyrene	N/A	N/A	N/A	11.5	7.3	7.3
Beryllium	N/A		0.002	2.6		N/A
alpha-BHC	N/A		0.008	11.1		6.3
beta-BHC	N/A		N/A	1.84		1.8
delta-BHC	N/A		N/A	4.75		N/A
gamma-BHC	N/A		0.0003	1.33		1.1
Cadmium (food)	N/A		0.001	6.1		N/A
Cadmium (water)	N/A		0.0005	6.1		N/A
Chlordane	N/A	0.0005	0.0005	1.61	1.3	0.35
Chloroform	N/A		0.01	0.081		0.031
Dieldrin	N/A	0.00005	0.00005	30.4	16	16
Heptachlor	N/A		0.0005	3.37		4.5
Heptachlor epoxide	N/A		0.000013	3.37		9.1
Nickel	0.01 b		0.02	1.05		N/A
Tetrachloroethene	N/A		0.01	0.051		0.54
Trichloroethene	N/A		N/A	0.011		0.013
Vinyl chloride	N/A		0.003	0.0175		0.72
trans-1,2-Dichloroethene	0.01 c		0.02	N/A		N/A
trans-1,3-Dichloropropylene	0.0026 a		0.03	N/A		0.1
2-Butanone	0.024 c		0.6	N/A		N/A
Barium	0.00029 b		0.2	N/A		N/A
Ethylbenzene	0.097 b		0.1	N/A		0.011
Fluoranthene	0.006 a		0.04	N/A		N/A
Lead (d)	0.0014 b		N/A	N/A		N/A
Silver	0.0014 a		0.005	N/A		N/A
Toluene	0.29 b		0.08	N/A		N/A
Xylenes	0.01 b		0.2	N/A		N/A
Zinc	0.21 b		0.3	N/A		N/A
Dibenzofuran	N/A		N/A	N/A		N/A
2-Methylnaphthalene	N/A		0.004	N/A		N/A
Acenapthene	N/A		0.06	N/A		N/A
Acenaphthylene	N/A		0.02	N/A		N/A
Anthracene	N/A		0.3	N/A		N/A
Benzo(a)anthracene	N/A		N/A	N/A		0.73
Benzo(b)fluoranthene	N/A		N/A	N/A		0.73
Benzo(g,h,i)perylene	N/A		0.02	N/A		N/A

Contaminant of Potential Concern	Oral Reference Dose (RfD) (mg/kg-day)			Oral Slope Factor (SF) $(mg/kg\text{-}day)^{-1}$		
	1989	1997 [e]	2009	1989	1997 [e]	2009
Benzo(k)fluoranthene	N/A		N/A	N/A		0.073
Chrysene	N/A		N/A	N/A		0.0073
Dibenz(a,h)anthracene	N/A		N/A	N/A		7.3
Fluorene	N/A		0.4	N/A		N/A
Indeno(1,2,3-cd)pyrene	N/A		N/A	N/A		0.73
Naphthalene	N/A		0.02	N/A		N/A
Phenanthrene	N/A		0.02	N/A		N/A
Pyrene	N/A		0.03	N/A		N/A

N/A = Not Applicable or Not Available

a. Derived from Acceptable Daily Intake (mg/day) divided by assumed body weight of 70 kg.
b. Derived from Acceptable Intake Chronic (mg/day) divided by assumed body weight of 70 kg.
c. Derived from Risk Reference Dose (mg/day) divided by assumed body weight of 70 kg.
d. Lead is currently evaluated through the use of exposure modeling for adults and children.
e. 1997 evaluation only looked at the analytes noted.

Changes in Exposure Pathways/Assumptions

There have been no changes in land use since the last five-year review.

One pathway of potential concern that was not evaluated in the 1989 risk assessment was the vapor intrusion pathway. This pathway may be of concern at sites where soil and shallow groundwater contaminated with VOCs exists in close proximity to occupied buildings. Except for the LNAPL Process Building and the Extraction Well Control Building, there are no buildings located above the shallow groundwater VOC plume that contains concentrations of naphthalene, 2-methylnaphthalene, ethylbenzene, toluene, xylene and other VOCs above vapor intrusion groundwater screening values. These two buildings are only visited occasionally (i.e., a few hours per week) to make sure they are secure or to perform periodic maintenance on and monitoring of equipment, therefore performance of a screening evaluation for vapor intrusion is not warranted at this time. However, should shallow groundwater VOC contamination continue to exist coincident with future site development involving the construction of buildings that will be occupied consistently (e.g., office space), the vapor intrusion pathway should be further evaluated to determine the potential risk to on-site workers. Because much of the site is located within wetland areas or the 100-year floodplain, existing zoning by-laws which establish use restrictions in floodplains and wetlands provide a degree of protection in that site re-development will be monitored or discouraged.

Neither the 1986 risk assessment nor the 1997 supplemental risk evaluation specifically assessed the risk to construction or excavation workers exposed to residual soil or shallow groundwater contamination during intrusive activities. Because this receptor population has not been evaluated, institutional controls preventing excavations into areas of the site with residual soil and/or shallow groundwater contamination should be prevented, or an evaluation should be performed to determine the potential risk to workers prior to initiating intrusive activities as part of site re-development.

Subsequent to the 1997 supplemental risk evaluation, the new method to evaluate compounds with mutagenic modes of action such as the carcinogenic PAHs is now recommended by EPA. The current

methodology calls for the use of age-specific adjustment factors to account for an increased sensitivity during early life. The early-life calculation does not affect the conclusions of the 1997 evaluation for the commercial scenario because workers are assumed to be greater than 16 years of age for which the early-life component is not applicable. The 1997 evaluation showed that the cancer risk for the child trespasser scenario was less than that for the commercial worker scenario. However, the supplemental early life calculation for child trespassers was not included as part of the 1997 evaluation since the EPA carcinogen risk assessment guidance was published subsequent to the completion of the site-specific risk evaluation. A supplemental calculation that included the early-life component for carcinogens with mutagenic modes of action, performed as part of this Five Year Review, confirmed the conclusion that child trespasser cancer risk is less than the commercial worker risk. Therefore, the conclusions of the 1997 supplemental risk evaluation continue to be valid. Institutional controls should be implemented to assure that future use of the site is consistent with the commercial land use assumptions used in the Site Reuse Study risk evaluation, and that child exposures of greater frequency and intensity than assumed for trespassing (60 days per year for 10 years) do not occur. The implementation of comprehensive institutional controls is on-going, and when complete, will provide long-term protectiveness for soil and groundwater remedies.

Because significant changes in risk assessment methods and assumptions have occurred since 1986, including the current requirement to evaluate compounds with mutagenic modes of action, a re-evaluation of the sediment cleanup levels has been performed to determine whether the changes in risk assessment methods affect remedy protectiveness. A comparison of sediment cleanup levels, developed using 2009 EPA methods and assumptions (including the early-life component for PAHs), to the sediment cleanup levels presented in the ROD are provided below. Target risk levels identified in the ROD were used for this evaluation:

Table 5. Sediment Cleanup Levels

Compound	ROD Cleanup Level	2009 Cleanup Level	Risk-Level (established in the ROD)
Arsenic	250 mg/kg	6.1 mg/kg	10^{-6}
PAHs	22 mg/kg	2.1 mg/kg	10^{-5}
DDT	19 mg/kg	27 mg/kg	10^{-6}
Chlordane	5 mg/kg	24 mg/kg	10^{-6}

The sediment cleanup levels for chlordane and DDT remain protective of human recreational exposures because the 2009 values are higher than the ROD values. The ROD arsenic sediment cleanup level of 250 mg/kg corresponds to approximately a 6×10^{-5} cancer risk. The ROD PAH cleanup level of 22 mg/kg would correspond to slightly greater than a 1×10^{-4} cancer risk, which is at the upper end of the EPA target risk range. The PAH cleanup level assumes that all PAHs present are the most toxic chemical in the group, benzo(a)pyrene. Because this is an overly conservative assumption, the PAH cleanup level is likely protective of human health since PAHs of lesser potency are likely to be the most prevalent compounds. However, this assumption should be confirmed by the comparison of benzo(a)pyrene equivalents calculated using current sampling data to the cleanup level adjusted to include the early-life component.

Action limits were also developed for the fish tissue ingestion pathway for total DDT (300 mg/kg), total PAHs (10 mg/kg), and total chlordane (320 mg/kg). The action limits are developed by the Food and Drug

Administration, designed to protect the average individual from potential adverse effects. Assuming a 14 g/day ingestion rate for recreationally-caught fish, the FDA action levels correspond to approximately a 1E-05 cancer risk for each compound. Therefore, the action limits for fish ingestion continue to be protective of human health.

Evaluation of Recent Sampling Data

As discussed in Section 6.3.2, arsenic, benzene, ethylbenzene, lindane, heptachlor epoxide, bis(2-ethylhexyl)phthalate, and pentachlorophenol in select monitoring wells continue to exceed MCLs. Continued exceedances of MCLs indicate that completion of the drinking water ingestion pathway would present a risk to residents. Since groundwater from the site is not currently used by area residents as a source of potable water, the drinking water exposure pathway is incomplete. Until groundwater concentrations meet interim cleanup levels (MCLs), institutional controls should be implemented at the Site to ensure that no private wells are installed at or near the Site.

No surface water monitoring data collected over the last five years were available for review, though contaminants in groundwater may potentially discharge to nearby surface water bodies where direct contact human exposures could occur. The second five-year review concluded that there was likely negligible risk to human recreational receptors exposed to surface water impacted by the site, based on sampling data collected in 2000. No further surface water sampling was recommended based on this conclusion. Surface water data from 2000 are compared in the table below to 2009 tap water risk-based screening levels (EPA, 2009), adjusted upward by a factor of 40 to account for differential ingestion of tap water and surface water while swimming (2 liters per day for tap water vs. 0.05 liters per swimming event). This comparison confirms that there is negligible risk associated with surface water exposure and corroborates the 2004 conclusion that no further surface water sampling is required.

Table 6. Surface Water Screening Levels

Compound	Maximum Surface Water Concentration	Risk-Based Concentration	Risk-Level
Arsenic	0.75 ug/L	1.8 ug/L	<1E-06
DDT	0.013 ug/L	8 ug/L	<1E-06
Chlordane	0.006 ug/L	7.6 mg/kg	<1E-06

No sediment monitoring data have been collected over the last five years. The second five-year review concluded that the remedy was protective with respect to human health because 2002 sediment concentrations were below the sediment cleanup levels, judged to be protective in 2004. However, as stated previously, the sediment PAH cleanup level may no longer be protective due to current EPA guidance for compounds with mutagenic modes of action. Therefore, the 2002 sediment data were compared in the table below to the 2009 sediment cleanup levels. Though the maximum concentrations of arsenic and total PAHs exceed the 2009 sediment cleanup levels, considering potential early life exposures, the cumulative risk associated with sediment exposure would not exceed 10^{-4}. Therefore, the remedy continues to be protective with respect to human health, based on 2002 sampling data. However, because arsenic and PAHs continue to exceed risk-based levels, additional sediment samples should be collected and evaluated as to protectiveness as part of the next Five-Year Review.

Table 7. Maximum Sediment Concentration Comparison to Cleanup Levels

Compound	2009 Cleanup Level	Maximum Sediment Concentration (2002)	Risk-Level
Arsenic	6.1 mg/kg	110 mg/kg	2E-05
PAHs	2.1 mg/kg	11.1 mg/kg	5E-05
DDT	27 mg/kg	2.4 mg/kg	<1E-06
Chlordane	24 mg/kg	0.63 mg/kg	<1E-06

No fish sampling data have been collected over the last five years. Fish sampling data collected in 2002 indicated exceedances of the PAH action level for human consumption, stated as being associated with a cancer risk of 10^{-5}. The maximum fish tissue PAH concentration was 229 mg/kg, which would be associated with a 10^{-3} cancer risk. Therefore, until sampling data are collected indicating that contaminant levels in fish are below action levels, the warning signs installed along the river cautioning recreational users about the potential dangers associated with the ingestion of fish caught from the river should be maintained.

7.2.2 Review of Ecological Risk Assessments and Toxicity Factors Serving as the Basis for the Remedy

The ecological risk assessment (ERA) performed for the 1986 Feasibility Study (FS) Report (GHR, 1986a) was conducted using the best science, methodologies, and professional judgment available at the time. However, the approach would not comply with contemporary guidelines (EPA, 1997). Since the ERA was written in 1986, EPA has promulgated guidelines to address screening out chemicals, selecting contaminants of concern, and performing risk calculations. Furthermore, many of the tools available today had not yet been created, such as benchmark screening values, toxicity data, or improved laboratory detection levels. Additional evaluations were performed in the second five-year review to assess risk to ecological receptors. These evaluations included modeling of the exposure of a small mammalian receptor exposed to the soils in the remediation area and comparison of fish tissue concentrations to toxicity reference values to assess potential adverse effects on fish exposed to site contaminants in the Cochato River. These results are summarized below regarding residual ecological risk from exposure to on-site soils and sediment in the Cochato River. A determination should be made, after additional sediment and fish tissue data have been obtained, whether an updated ecological risk assessment should be performed.

Since the last five-year review, there are no newly promulgated standards, relevant to the site, which bear on the protectiveness of the remedy. There are no major changes in site conditions or exposure assumptions on which the risk assessment was based that would result in increased exposure or risk.

7.2.2.1 Soil Excavation. The ERA concluded that there would be significant risk to ecological receptors from pesticides, SVOCs, and dioxin, although the ERA did not recommend site specific clean-up levels derived from ecological endpoints (as would be done using current guidelines). The limits of cleanup were based on the nature and extent of soil contamination documented in the RI/FS; the ROD specified the excavation of soil from "hot areas" based on contamination profiles developed in the RI Addendum (GHR, 1986b). The limits of excavation were established so that contaminant concentrations outside of the hot areas were one to two orders of magnitude lower than the concentrations inside the hot areas. Excavated

soil and sediment were treated by on-site incineration and backfilled in upland areas. Limits of excavation were established to minimize disruption to wetlands.

Although the limits of excavation were not determined using ecologically based risk criteria, the remedy likely eliminated risk to ecological receptors from pesticides and other organic contaminants in soil within the excavated area. As part of the second five year review, an evaluation was performed to estimate the exposure of a short-tail shrew as a receptor exposed to the soils in the remediated area. Using the maximum analyte concentrations in quarterly ash samples reported in Table A-1 of the Evaluation of Potential Future Reuse Opportunities of the Baird & McGuire Site report (M&E, 1998), a preliminary model was run to estimate exposure of selected SVOCs and inorganics to a small mammal (shrew) living in the remediated area. Based on this preliminary model, the second five-year review concluded that the remedy implemented for upland soils was protective for ecological receptors, although a more thorough model which uses UCLs and average concentrations, and evaluates risk from all site contaminants would be needed to confirm this conclusion with greater certainty. No confirmatory samples were collected during soil excavation, nor were there additional soil sample data collected for this third five-year review, thus it could not be determined whether or not the limits of excavation were sufficient to remove concentrations of contaminants to levels which are protective to ecological receptors under contemporary ARARs.

7.2.2.2 River Sediments. Action limits for river sediments and river bank soils were based on human health criteria, thus the top six inches of sediment were removed from the excavation area, and riverbanks were restored with clean material. Because action limits were not based on ecological criteria, it could not be determined with certainty whether or not the action limits were sufficient to remove concentrations of contaminants to levels which are protective of ecological receptors under contemporary ARARs. However, because the zone of biological activity in sediments (i.e., the oxidized zone) typically consists of the top six inches (Rosenberg and Resh, 1993), and because the oxidized zone is where most species concentrate their interaction with their environment (USEPA, 2000), removal of the top six inches of sediment and replacement with clean material likely mitigates the risk of contaminants to benthic and aquatic ecological receptors.

No confirmatory samples were collected during sediment excavation, nor were there additional sediment sample data collected for this third five-year review, thus it could not be confirmed whether or not the limits of excavation were sufficient to remove concentrations of contaminants to levels which are protective to ecological receptors under contemporary ARARs.

The remedy also included conducting long-term fish tissue monitoring in the river. In the second five-year review, maximum fish body burden data collected during the September/October 2002 round of sampling (M&E, 2003) were compared to toxicity reference values (TRVs). TRVs were obtained from the Environmental Residue Effects Database (ERED) (USACE, 2004). TRVs were selected from chronic no-observed effects-dose (NOED) studies with reproductive endpoints. The comparison indicated that because fish body burdens are below TRVs, there is negligible risk to fish, thus the remedy is protective of fish. No studies added to the ERED database since the last five-year review would alter the selection of TRVs used in the last five-year review. No additional fish tissue data were collected for this third five-year review, thus it could not be confirmed whether or not the concentrations of contaminants in fish continue to indicate negligible risk to fish populations.

7.2.3 ARARs Review

Review of Applicable or Relevant and Appropriate Requirements was performed to check the impact on the remedy due to changes in standards that were identified as ARARs in the three RODs and in the previous Five-Year Review Report (EPA, 2004), newly promulgated standards for chemicals of potential concern, and TBCs (to be considered) that may affect the protectiveness of the remedy. The results of the 2004 ARARs review, which was conducted consistent with the most recent five-year review guidance (EPA, 2001), were used as a basis for this review. The tables in Attachment 7 provide the ARARs review. The review is summarized below.

The ARARs presented in the Attachment 7 tables include:

Location-specific:

- Resource Conservation and Recovery Act (RCRA)
- Clean Water Act (CWA)
- Fish and Wildlife Coordination Act (16 U.S.C. 661)
- Wetlands Executive Order (EO 11990)
- Executive Order (EO 11988)
- Massachusetts Wetlands Protection Regulations
- Massachusetts Hazardous Waste Facility Location Regulations
- Massachusetts Environmental Policy Act (MEPA) Regulations
- Massachusetts Certification for Dredging, Dredged Material Disposal and Filling in Waters
- Department of Environmental Management (DEM) Inland Wetland Orders

Chemical-specific:

- Safe Drinking Water Act (SDWA)
- Resource Conservation and Recovery Act (RCRA)
- Federal Ambient Water Quality Criteria (AWQC)
- EPA Office of Water Guidance - Water-related Fate of 129 Priority Pollutants (1979)
- Threshold Limit Values (TLVs)
- National Oceanic Atmospheric Administration (NOAA)
- Ontario Ministry of Environment and Energy (OMEE)
- Massachusetts Drinking Water Requirements
- Massachusetts Surface Water Quality Standards
- Massachusetts Air Quality/Air Pollution Regulations
- Massachusetts Guidance on Acceptable Ambient Air Levels (AALs)

Action-Specific:

- Resource Conservation and Recovery Act (RCRA)
- Clean Water Act (CWA)
- Clean Air Act (CAA)
- Department of Transportation (DOT) Rules for Transportation of Hazardous Materials
- Massachusetts Hazardous Waste Regulations, Phase I and II
- Massachusetts Solid Waste Management Regulations
- Massachusetts Wetlands Protection Regulations
- Massachusetts Surface Water Discharge Permit Program Regulations
- Massachusetts Certification for Dredging, Dredged Material Disposal, and Filling in Waters

- OSHA General Industry Standards, Recordkeeping and Reporting, and Standards for Hazardous Waste Site Operations

Tables A7-1, A7-2, and A7-4 of Attachment 7 provide an evaluation of ARARs for the first two operable units (OU-1, OU-2) using the regulations and requirement synopses listed in the RODs as a basis. Tables A7-5, A7-6, and A7-7 provide an evaluation of ARARs for OU-3 likewise using the regulations and requirement synopses listed in the ROD as a basis. Location specific ARARs applicable to all operable units are summarized in Table A7-3. The evaluation includes a determination of whether the regulation is currently ARAR or TBC and whether the requirements have been met. Most of the listed ARARs remain applicable or relevant and appropriate to the site. Some of the listed ARARs were for the soil remediation phase of the remedy, which was completed in 1997, and hence they are listed as formerly applicable or formerly relevant and appropriate. Those that are still applicable or relevant and appropriate are being complied with.

7.3 QUESTION C: HAS ANY OTHER INFORMATION COME TO LIGHT THAT COULD CALL INTO QUESTION THE PROTECTIVENESS OF THE REMEDY?

No. There is no other information that calls into question the protectiveness of the remedy.

7.4 TECHNICAL ASSESSMENT SUMMARY

According to the data reviewed, the site inspection, and the interviews, the remedy is functioning as intended by the RODs, as modified by the two ESD documents. There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy. Most of the ARARs identified in the RODs remain applicable or relevant and appropriate and either have been met or are being complied with.

SECTION 8.0
ISSUES

Based on the activities conducted during this five-year review, the issues identified in the following table have been noted.

Table 8: Issues

Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
Groundwater at the site contains concentrations of VOCs, SVOCs, metals, and pesticides above action limits. The groundwater is currently treated to concentrations below MCLs.	N	Y*
During the last five year review, sediment along the river contained PAHs above action limits and concentrations of metals and pesticides had not decreased significantly since the previous five year review. Additional monitoring is needed to ensure continued protectiveness.	N	Y*
During the last five year review, fish tissue contained PAHs at concentrations above action limits; however, fish contamination may not all be site related. Warning signs provide a degree of current protectiveness. Additional monitoring is needed to ensure continued protectiveness.	N	Y*
Comprehensive institutional controls have not been implemented.	N	Y*
Some areas of replicated wetland are dominated by invasive species, primarily phragmites.	N	N

*Future protectiveness is dependent upon continued GWTF operation until contaminant concentrations no longer exceed the action limits (interim groundwater cleanup levels (MCLs), sediment cleanup levels, and FDA action levels for fish).

SECTION 9.0
RECOMMENDATIONS AND FOLLOW-UP ACTIONS

In response to the issues noted above, it is recommended that the actions listed in the following table be taken:

Table 9: Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness	
					Current	Future
Groundwater at the site contains contaminants above action limits	Continue operations of GWTF; re-establish MNA monitoring program.	State	State/EPA	2014	N	Y*
	Revisit evaluation of arsenic presence and mobility to determine if conclusions are still valid and develop a plan of action to address high concentrations.	State	State/EPA	2014	N	Y*
	Optimize extraction system efficiency	State	State/EPA	2014	N	N
	Collect samples for MNA parameters from select monitoring wells	State	State/EPA	2014	N	N
	Evaluate the LNAPL collection system to improve LNAPL removal/separation.	State	State/EPA	2014	N	N
During the last five year review, sediment along the river contained PAHs above action limits and concentrations	Conduct sediment monitoring; continue operations of the GWTF; maintain site fencing	State	State/EPA	2014	N	Y*

Table 9: Recommendations and Follow-up Actions						
Issue	**Recommendations and Follow-up Actions**	**Party Responsible**	**Oversight Agency**	**Milestone Date**	**Affects Protectiveness**	
					Current	**Future**
of metals and pesticides had not decreased significantly since the previous five year review.						
During the last five year review, fish tissue contained PAHs at concentrations above action limits.	Conduct fish tissue monitoring; maintain warning signs	State	State/EPA	2014	N	Y*
Institutional controls are not complete.	Complete the implementation of comprehensive institutional controls.	State/EPA	State/EPA	2014	N	Y
Some areas of replicated wetland are dominated by invasive species, primarily phragmites.	Initiate program to monitor and control invasive species in site wetlands	State	State/EPA	2014	N	N

*Future protectiveness is dependent upon continued GWTF operation until contaminant concentrations no longer exceed the action limits (interim groundwater cleanup levels, sediment cleanup levels, and FDA action levels for fish).

SECTION 10.0
PROTECTIVENESS STATEMENTS

OU-1

The remedy at OU1 currently protects human health and the environment because the current pathway for human health exposures has been eliminated as the contaminated aquifer is no longer being used as a drinking water source. The aquifer is being remediated to mitigate a future human health exposure pathway, and data indicates that the plume of organic contamination is shrinking. However, in order for the remedy to be protective in the long-term, the groundwater treatment plant, recharge basins, monitoring wells, extraction wells, LNAPL recovery system, and piping network must remain operable and undisturbed. Groundwater should not be used for any purpose or directly contacted, due to its contamination and to the negative impact pumping could have on the effectiveness of the extraction and treatment system. It is important to complete the implementation of comprehensive institutional controls at the site to ensure long-term protectiveness in and around the site.

OU-2

The remedy at OU2 currently protects human health and the environment. As long as the Site is not used for residential purposes or other purposes where children are present at a high frequency (e.g., day care or parks), human health protectiveness will be within the risk-based concentrations established by EPA. Protectiveness is achieved for future workers in a commercial or industrial use scenario. Contaminants present at depths greater than 15 feet below grade are considered unlikely to be contacted directly by individuals during future Site development activities, including construction and utility work.

However, in order for the remedy to be protective in the long-term, completion of comprehensive institutional controls is needed.

OU-3

The remedy at OU3 currently protects human health and the environment because sediment with high levels of contaminants was excavated and treated, and clean fill was used to replace materials excavated. However, to minimize disruption to wetlands, sediments were not removed from areas of the river where contaminant concentrations were low. Although contaminated sediments remain, it is expected that natural degradative, depositional, and dispersal processes will gradually reduce remaining concentrations in the sediment. In order for the remedy to be protective in the long-term, it is recommended that long-term sediment and fish tissue monitoring continue to evaluate contaminant levels and their behavior over time. However, the State currently has no monitoring plan in place.

OU-4

There is no protectiveness statement required for OU-4.

Comprehensive Protectiveness Statement

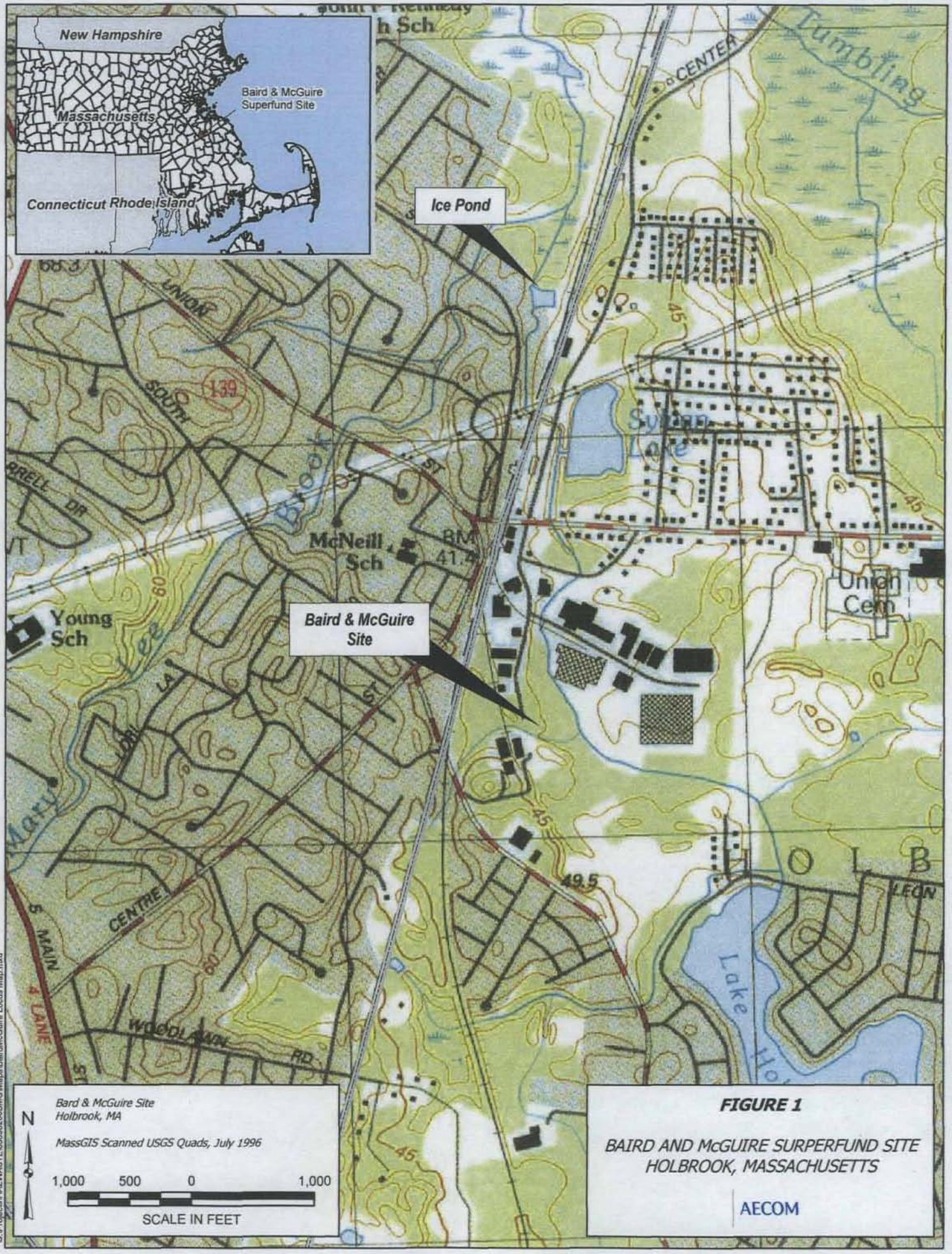
Because all remedial actions at all OUs are protective, the site is protective of human health and the environment. The remedy currently protects human health and the environment because current exposure pathways that could result in unacceptable risks are being controlled. All threats at the Site have been or are being addressed through groundwater treatment; removal, incineration, and stabilization of contaminated soil and ash; site fencing; warning signage, and expansion of an alternate water supply.

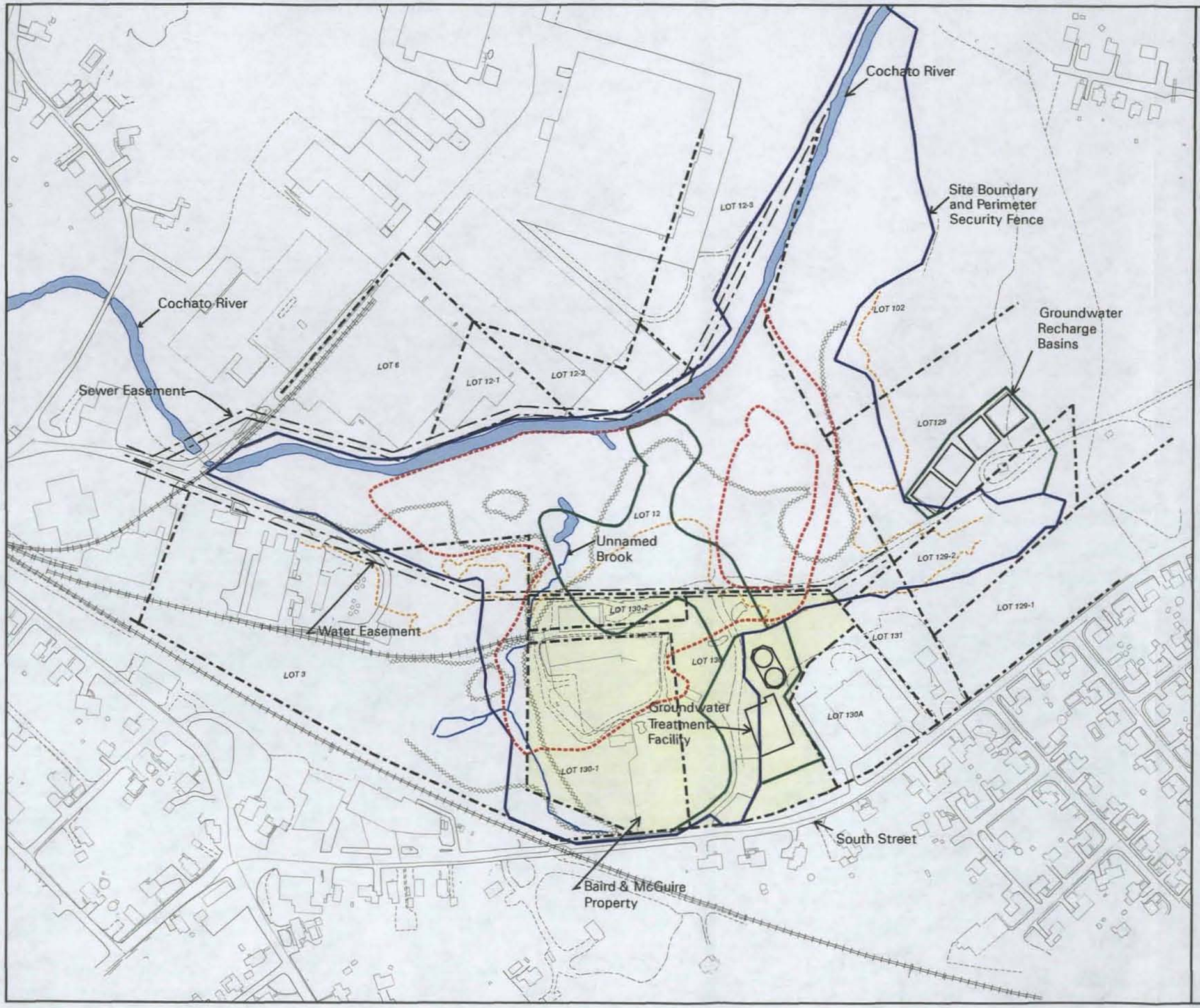
However, in order for the remedy to be protective in the long-term, it is important to complete the implementation of comprehensive institutional controls at the site to maintain a complete level of protectiveness for future activities in and around the site, and through continued monitoring of groundwater, sediment, and fish tissue.
It is essential that monitoring of these media continue in order to ensure that long-term cleanup goals are being met.

SECTION 11.0
NEXT REVIEW

Five-year reviews are done every five years at sites where contaminant levels remain at concentrations that prevent unlimited, unrestricted use of the Site. Since remedial actions have not been completed for all operable units, and since the remedy does not allow for unrestricted use of the Site, a follow-up five-year review will be required. Five-year reviews are triggered by the date remedial actions are initiated at any operable unit. When a five-year review is conducted at a time other than when it is due, the next five-year review is due within five years of the time when it was originally required (U.S. EPA, 1994). Each five-year review is to cover all operable units, whether or not remediation at that unit is complete (EPA, 1994). The next five-year review for the Baird & McGuire Site should be conducted in 2014.

ATTACHMENT 1
SITE MAPS AND FIGURES


New Hampshire
Baird & McGuire Superfund Site
Massachusetts
Connecticut
Rhode Island
Ice Pond
Baird & McGuire Site
McNeill Sch
Young Sch
Union Cem
Sylvan Lake
Lake
CENTER
UNION
SOUTH
CENTRE
MAIN
4 LANE
WOODLAWN
RD
ST
DR
139
45
49.5
60
BM 41.4
Bard & McGuire Site
Holbrook, MA
MassGIS Scanned USGS Quads, July 1996
N
1,000 500 0 1,000
SCALE IN FEET
FIGURE 1
BAIRD AND McGUIRE SURPERFUND SITE
HOLBROOK, MASSACHUSETTS
AECOM
G:\Projects\HAZWASTE\60098266BMG\Maps\BairdMcGuire Locus Map.mxd



LEGEND

- Limit of Excavation
- Property Lines
- Easement
- Site Boundary and Perimeter Fenceline
- Additional Fencing
- Roads
- Streams
- Wetland Delineation
- 100 Year Floodplain
- Ponds and Waterbodies
- Baird & McGuire Property

MAP SOURCE:
Base Map is from Eastern Topographics (May 4, 1988).
Site features are compiled from numerous project plans and documents. All locations are approximate.

Metcalf & Eddy

N

250 0 250

SCALE IN FEET

Figure 2.
BAIRD & McGUIRE
SITE FEATURES.

BAIRD & McGUIRE SUPERFUND SITE
M&E Print Date: September 28, 2004

slkatest-a

ATTACHMENT 2
LIST OF DOCUMENTS REVIEWED / REFERENCES

ATTACHMENT 2
LIST OF DOCUMENTS REVIEWED / REFERENCES

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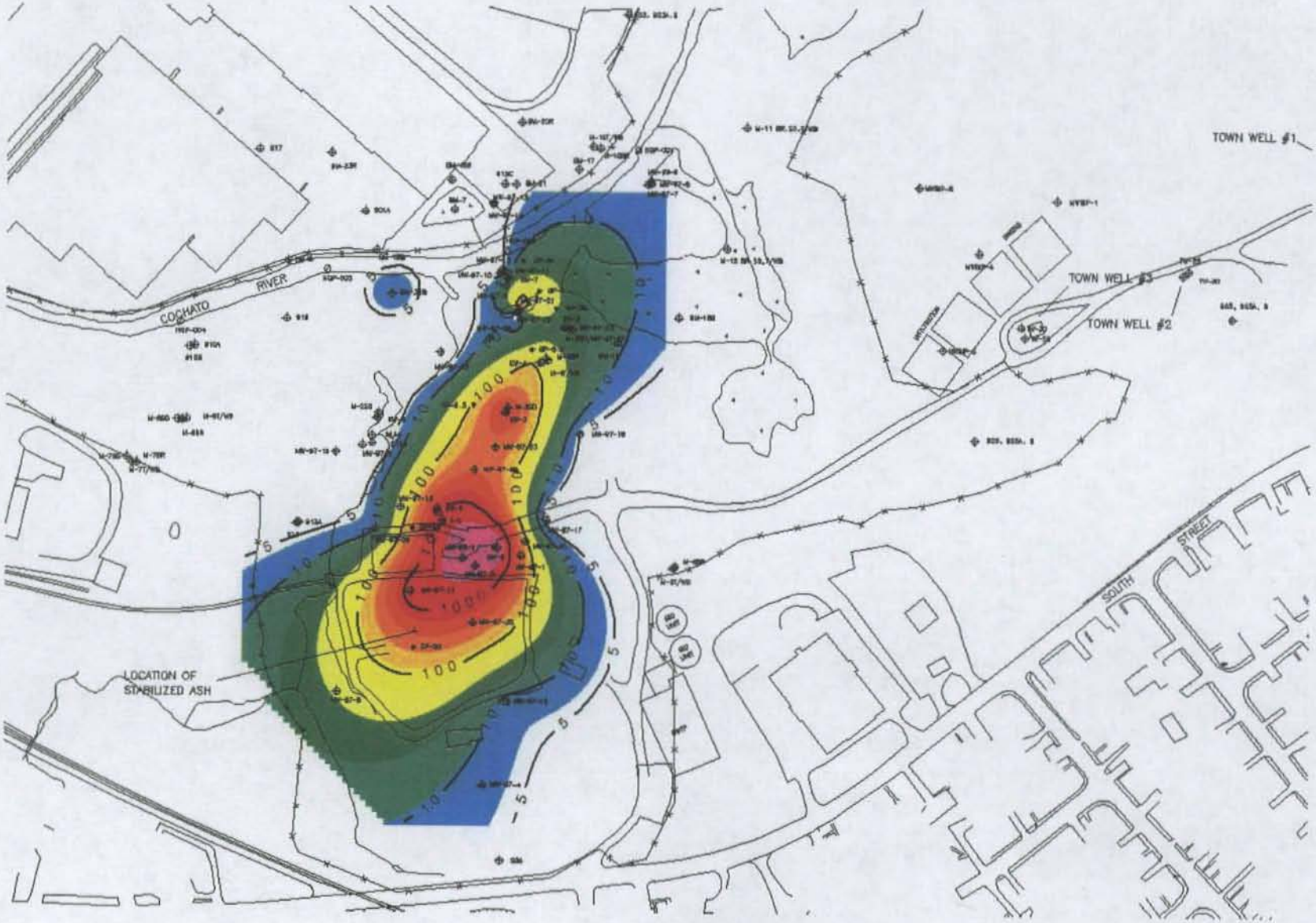
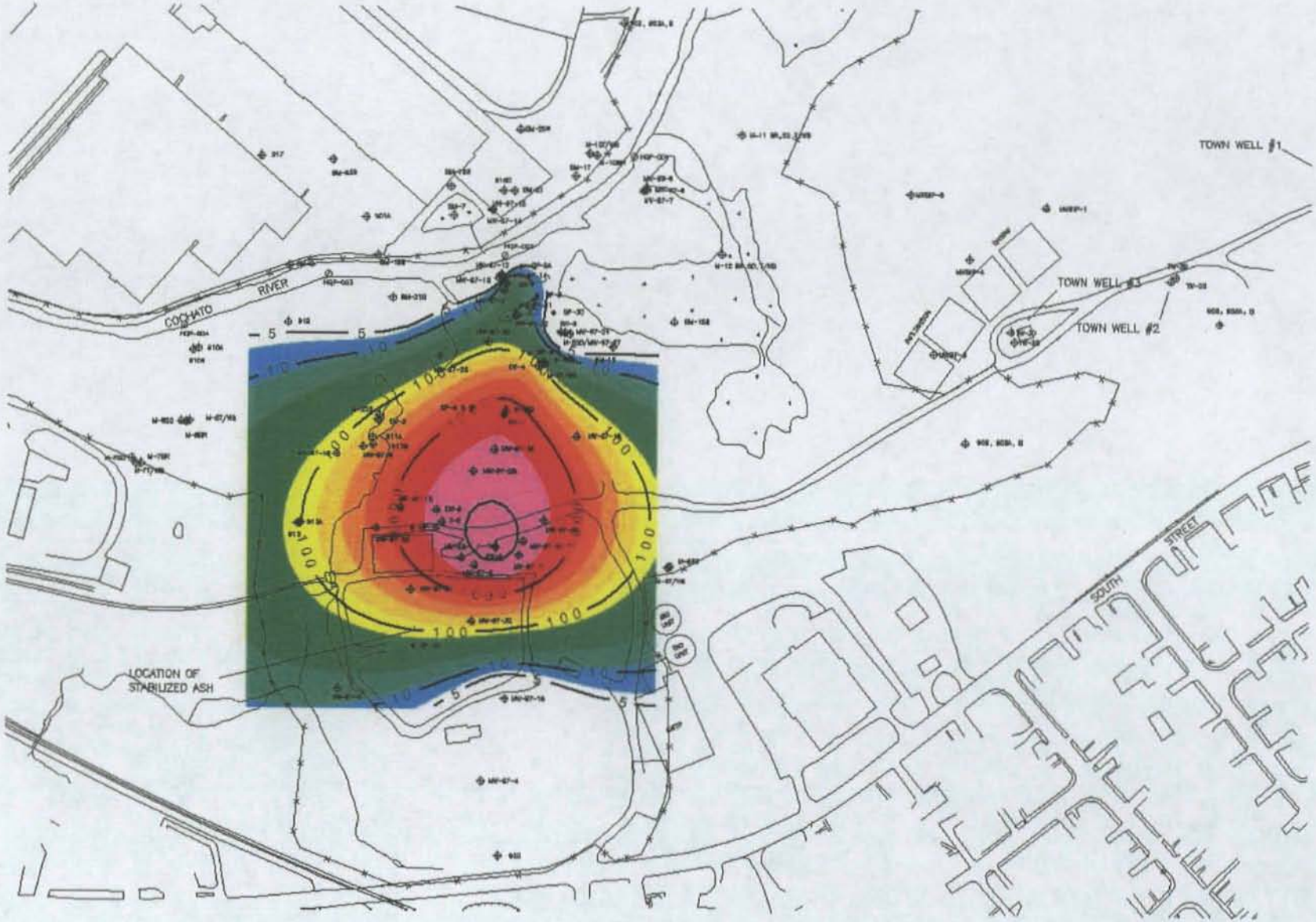
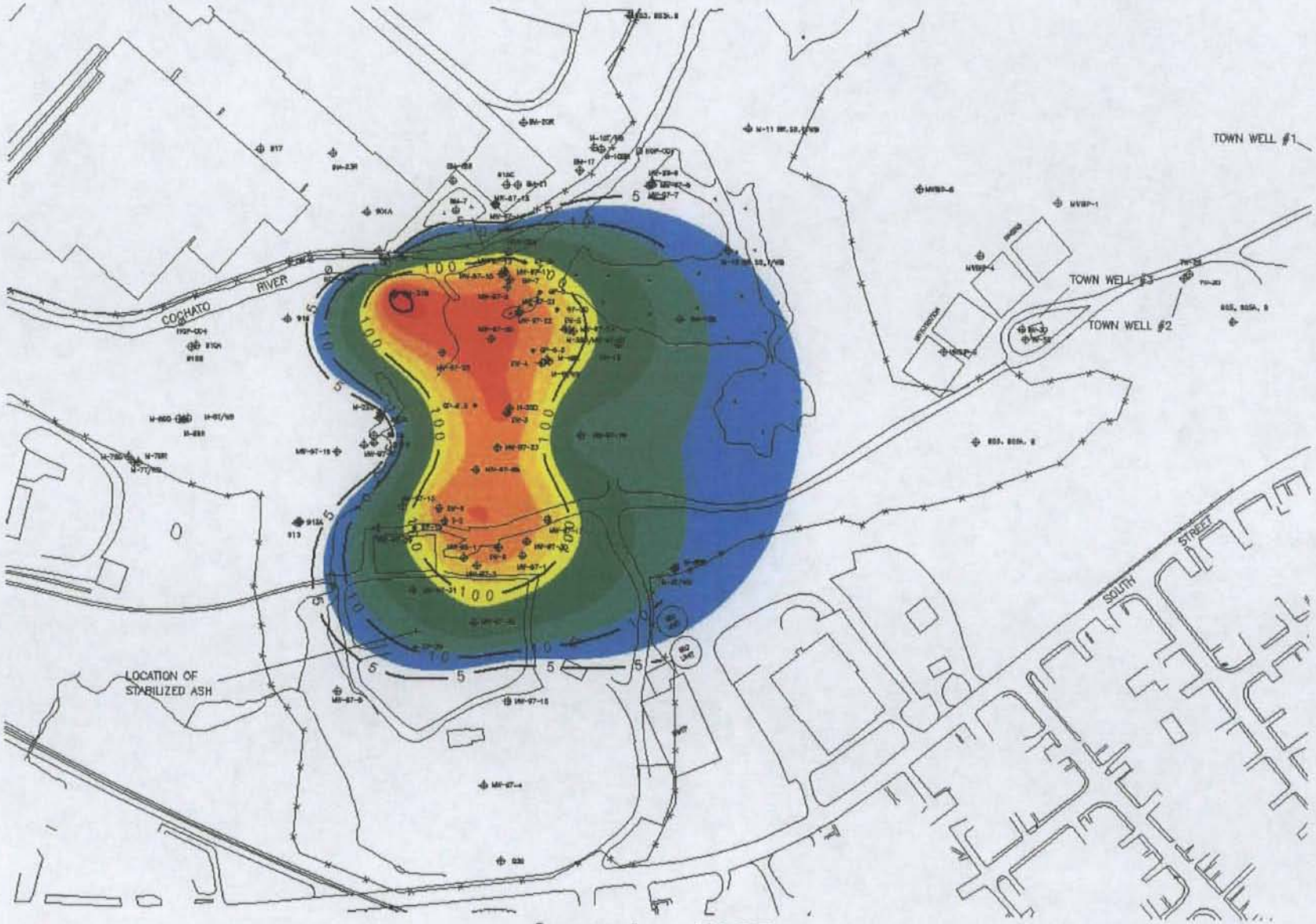
ATTACHMENT 3
PLUME MAPS OF TOTAL SVOC AND ARSENIC CONCENTRATIONS IN OVERBURDEN GROUNDWATER - 2007
Prepared by AECOM. 2009


TOWN WELL #1
TOWN WELL #3
TOWN WELL #2
COCHATO
RIVER
LOCATION OF
STABILIZED ASH
SOUTH
STREET
100
10
5

SVOCs - 2007


TOWN WELL #1
TOWN WELL #3
TOWN WELL #2
COCHATO
RIVER
LOCATION OF
STABILIZED ASH
SOUTH
STREET

VOCs - 2007



Arsenic - 2007

ATTACHMENT 4
HISTORICAL VOC, SVOC, AND ARSENIC CONCENTRATIONS IN GROUNDWATER

Prepared by AECOM 2009

TABLE A4-1. HISTORICAL VOC AND SVOC CONCENTRATIONS AT SITE WELLS

Overburden Wells	Replacement Well	Well Type	8/88,9/88 Total VOCs (ppb)	4/94 Total VOCs (ppb)	10/94 Total VOCs (ppb)	3/95 Total VOCs (ppb)	4/95 Total VOCs (ppb)	8/97,9/97,10/97 Total VOCs (ppb)	8/98,9/98,10/98 Total VOCs (ppb)	02/00 - 05/00 Total VOCs (ppb)	04/01 - 07/01 Total VOCs (ppb)	04/02 - 07/02 Total VOCs (ppb)	04/03 - 06/03 Total VOCs (ppb)	03/04 - 05/04 Total VOCs (ppb)	06/05 Total VOCs (ppb)	10/06 Total VOCs (ppb)	08/07 - 10/07 Total VOCs (ppb)
Area A (east side of river)																	
BM-7		SD						1.55	ND	0.16	ND	ND	ND				
BM-8		SD	13.7					18	4.1	2.15	0.58	ND	0.71	0.57			
BM-13B		SD	787					44.93	6.7	3.81	5.1	2.85	1.1	ND	ND	ND	ND
BM-17		SD	7420		1224		24.9	28.24	ND	ND	ND	ND	ND				
BM-18R		SD	2293				736	8.66	ND	ND	ND	ND	ND	ND			
BM-20R		SD	1.4	ND			ND	0.057	ND	ND	0.41	ND	ND				
BM-21		SD						10.32	ND	ND	ND	ND	ND				
BM-23R		SD	660				ND	0.87	7.5	4.71	1.46	1.05	0.77				
901A		SD						7.71	2.51	6	1.73	ND	1.06				
903B		SD	ND				ND	ND	ND	ND			ND				
915A	MW-97-13	T						8.37	3.97	1.17	3.21	1.32	4.42	2.51	ND	5.38	ND
915B	MW-97-14	SD						759.6	0.61	ND	ND	ND	ND				
M-10T/WB		T/WB						1.07	ND	ND							
Area B (plume wells)																	
BM-2	MW-97-17	SD						655	238		63.3	40.29	69.26	13.9			
BM-4A		SD	14590														
BM-10	MW-97-18	SD						ND	ND	ND	ND	ND	ND	ND			
BM-30		SD	140.2				11.4										
BM-32B	MW-97-20	SD							0.54	ND	ND	ND	ND				
BM-34A	MW-97-21	SD						3925	2303	1129.2	1014	412.8	208.1	10.32			
BM-34B	MW-97-22	SD					5630	1476	6.05	2.78	2.58	4.02	ND	3.4			
BM-35	MW-97-23	SD	13490					3317	6470	4894	4770.5	2573	1250				
BM-37	MW-97-24	SD	124.9					0.44	ND	ND	ND	ND	ND				
BM-38	MW-97-25	SD						34	4.52	6.94	4.67	3.69	4.61	1.89			
902A	MW-97-3	SD	11540					10120	4870	2209	1722	531.6	288.8				
902B		SD	7319														
904B		SD	490														
914C	MW-97-12	SD	10169				9045	5005	1918	95.06	107.47	111	3.08	4.36			
914B	MW-97-11	SD	7860				11725	1245	8.15	17.54	5.665	5.3	5.9				
914A	MW-97-10	T							1938	9.66	8.65	9.17	0.99	9.27	ND	2.6	ND
M-1T/WB	MW-97-15	T/WB					148.6	7.4	9.4	3.03	1.83	ND	0.49				
M-9T/WB	MW-97-16	T						5.65			ND	ND	ND	1 76	ND	ND	ND
M-3SD		SD						630.2	935	308.4	569.7	629.8	683.3				
M-5SD	MW-97-27	SD						ND	ND	ND	ND		ND				
MW-97-1		SD								3700	2857	2300	2348				

TABLE A4-1. HISTORICAL VOC AND SVOC CONCENTRATIONS AT SITE WELLS

Overburden Wells	Replacement Well	Well Type	8/88,9/88 Total VOCs (ppb)	4/94 Total VOCs (ppb)	10/94 Total VOCs (ppb)	3/95 Total VOCs (ppb)	4/95 Total VOCs (ppb)	8/97,9/97,10/97 Total VOCs (ppb)	8/98,9/98,10/98 Total VOCs (ppb)	02/00 - 05/00 Total VOCs (ppb)	04/01 - 07/01 Total VOCs (ppb)	04/02 - 07/02 Total VOCs (ppb)	04/03 - 06/03 Total VOCs (ppb)	03/04 - 05/04 Total VOCs (ppb)	06/05 Total VOCs (ppb)	10/06 Total VOCs (ppb)	08/07 - 10/07 Total VOCs (ppb)
MW-97-2		SD											2.67				
MW-97-28		SD								5525	7282	2069	644.9				
MW-97-29		SD									0.83	ND	ND	0.35			
MW-97-30		SD									1364	620.6	269				
MW-97-31		SD								0.48	ND	ND	ND	ND			
MW-97-32		SD								62.49	177.8	216.9	26.96	349	672	3556	453
MW-98-1		SD								1427.1	1051.2	1886 9	1412.2				
EW-1		T/WB		38	48.9	49.2	27.6										
EW-3		SD		4467	4260	2785	11870	1104	785	521.8	191.6	221	198 4	164.6	1117.6	850	2012
EW-4	EW-4A	T/WB		377	375	229	435	10.97	2.52	0.84	ND	ND		23.55	3249	276.2	1210
EW-5		SD		653	780	575	726.8	19.9	6.34	1.28	1.1	ND	0 29	ND	ND	68.6	ND
EW-6		SD		2829	4683	2767	3061.5	2254	1956	3484	3024.8	1552.4	1145.8	2384	6728	4474	4194
EW-7		SD							142 7	39.1	23.5	11.89	4 98	0.88	ND	2110	54.1
EW-8		SD								2668	1637.3	388	329	967.6	6857	4880	25312
EW-9		SD														ND	56.4
Area C (north of plume)																	
BM-14	MW-97-19	SD	355.9				23.9	12.3	1.93	0.29	0.38	ND	ND				
BM-31B		SD			2.4		1.6	1.81	1.53	ND			11.14	14.18	5.34	12.16	ND
909A		SD	180	ND			ND										
910A		T		11			18.3		1.1	0.31	0.33	ND	ND				
910B		SD		6			18	15.6	1.36	0.31							
911A		T									ND	ND	0.42	ND			
911B		SD	28				14.9	10.81	2.15	0.29	ND	ND	ND				
912A	MW-97-8	SD	9.4	5	5		2	1.6	ND	ND							
913A		SD						9.47	1.79	ND	2.49	ND	ND				
919		SD						9.35	3.8	6.88	6.74	5.25	2.55	ND	ND		
M-2SD		SD						15.04	5.45	0.86							
M-7SD		SD			5.4		11.9	1.79	ND	0.36	0.8	ND	ND				
M-7T/WB		T/WB						3.92	0.76	1.37	2.02	1.78	1.11				
M-8SD		SD		5	5		18.5	11.64	ND	0.39			ND				
M-8T/WB		T/WB						10.4	ND				0.28				
EW-2		SD		146	62.5	10	19	21.15	4.32	4.58	2	ND	0.64	0.79	ND		
Area D (south of plume)																	
BM-15B		T									ND	ND	ND				
912B	MW-97-9	SD	38	ND	1.4		4	1.4	ND	ND	ND	1.87	ND	ND			
M-6T/WB		T/WB						ND	ND		ND	ND	ND				
M-11SD		SD		7	0.8		ND										

TABLE A4-1. HISTORICAL VOC AND SVOC CONCENTRATIONS AT SITE WELLS

Overburden Wells	Replacement Well	Well Type	8/88,9/88 Total VOCs (ppb)	4/94 Total VOCs (ppb)	10/94 Total VOCs (ppb)	3/95 Total VOCs (ppb)	4/95 Total VOCs (ppb)	8/97,9/97,10/97 Total VOCs (ppb)	8/98,9/98,10/98 Total VOCs (ppb)	02/00 - 05/00 Total VOCs (ppb)	04/01 - 07/01 Total VOCs (ppb)	04/02 - 07/02 Total VOCs (ppb)	04/03 - 06/03 Total VOCs (ppb)	03/04 - 05/04 Total VOCs (ppb)	06/05 Total VOCs (ppb)	10/06 Total VOCs (ppb)	08/07 - 10/07 Total VOCs (ppb)
M-12SD		SD					ND			ND	ND	ND	ND				
M-12T/WB		T/WB								ND	ND	ND	ND				
Area E (west of plume - upgradient)																	
920		SD								ND	0.85	1.48					
Bedrock Wells	**Replacement Well**																
Area A (east side of river)																	
901		BR					3.7										
903		BR	0														
BM-13		BR	198 8				50.7										
M-10BR		BR		ND	2.7		0.8	2.18	0.58	ND	4 95	ND	ND				
Area B (plume wells)																	
902-1		BR	1811														
902-2		BR	590														
904		BR	1200														
M-4BR		BR					25.7			5.71	3.09	2.18	1.72				
Area C (north of plume)																	
909	MW-97-5	BR	180	ND			ND	ND	ND	ND	ND	ND	ND				
910		BR	24.9	10	10		15.4										
911	MW-97-6	BR	768.2				10.5	2.9	1.2	0.14		ND	ND				
913		BR	25.1				19	14.9	10.28	3.26	2.28	ND	0.78				
M-7BR		BR			5.4		8.3	6.96	7.65	4.96		5.97	3.56				
M-8BR		BR		4	18		16.7	10.1	3.62	2.86	2.57	2.69	2.7				
Area D (south of plume)																	
905		BR	1360				ND										
912	MW-97-7	BR	13.1	ND	3 8		2.5	1.63	1.73	1.33	1.98	ND	1.1				
M-6BR		BR					ND	4.2	ND		ND	ND	ND				
M-12BR		BR			2.7		13.1			0.51	1.52	ND	ND				
Area E (west of plume - upgradient)																	
908	MW-97-4	BR	ND	ND													

Notes

SD: stratified drift

T: till

BR: bedrock

T/WB: till and weathered bedrock

Maximum detected concentration selected for duplicate samples.

ND: non-detect

Blank Space: not sampled

TABLE A4-1. HISTORICAL VOC AND SVOC CONCENTRATIONS AT SITE WELLS

Overburden Wells	Replacement Well	8/88,9/88 Total SVOCs (ppb)	4/94 Total SVOCs (ppb)	10/94 Total SVOCs (ppb)	3/95 Total SVOCs (ppb)	4/95 Total SVOCs (ppb)	8/97,9/97,10/97 Total SVOCs (ppb)	8/98,9/98,10/98 Total SVOCs (ppb)	02/00 - 05/00 Total SVOCs (ppb)	04/01 - 07/01 Total SVOCs (ppb)	04/02 - 07/02 Total SVOCs (ppb)	04/03 - 06/03 Total SVOCs (ppb)	03/04 - 05/04 Total SVOCs (ppb)	06/05 Total SVOCs (ppb)	10/06 Total SVOCs (ppb)	08/07 - 10/07 Total SVOCs (ppb)
Area A (east side of river)																
BM-7							16.2	4.3	ND	ND	ND	ND				
BM-8		ND					ND	ND	ND	ND	ND	ND	ND			
BM-13B		ND					3	4.2	ND	ND	ND	ND	ND	ND	ND	3.32
BM-17		6570		1938		62	31.7	14.6	3.5	14.1	ND	ND				
BM-18R		840				97	ND	ND	ND	ND	ND	ND	ND			
BM-20R		13	ND			110	ND	ND	ND	ND	ND	ND				
BM-21							23.4	2.7	ND	ND	ND	ND				
BM-23R		65				ND	ND	ND	ND	ND	ND	ND				
901A							5.2	ND	ND	ND	ND	ND				
903B		ND				6	ND	ND	ND			ND				
915A	MW-97-13						2.8	3	ND	ND	ND	ND	ND			
915B	MW-97-14						3115	9.1	2.6	ND	ND	ND				
M-10T/WB							2.7	ND	ND							
Area B (plume wells)																
BM-2	MW-97-17						6452	2652		957	616	421	323.9	342.8	120.02	2.93
BM-4A		15440														
BM-10	MW-97-18						ND	ND	ND	ND	ND	ND	ND	ND	ND	4.54
BM-30		27				ND										
BM-32B	MW-97-20							5.7	ND	ND	ND	ND				
BM-34A	MW-97-21						7284	6113	4056	2679	1484	285	950	ND	318.7	258.68
BM-34B	MW-97-22					9098	3482	46.9	4 6	4.2	ND	ND	4.8	1233	2.36	3.86
BM-35	MW-97-23	22320					686900	42620	20690	18398	29560	6950				
BM-37	MW-97-24	94					573.3	66	38.9	8.9	ND	ND				
BM-38	MW-97-25						74.6	6.7	ND	ND	ND	ND	ND	ND	ND	1.77
902A	MW-97-3	49200					4578	2049	4545000	6239	17740	4520				
902B		8520														
904B		ND														
914C	MW-97-12	11500				734	7141	6032	510	834.2	171	70	ND			
914B	MW-97-11	10440				855	2937	46.7	57.9	3.2	ND	ND				
914A	MW-97-10							5286	ND	4.3	ND	ND	60.7	ND	ND	3.43
M-1T/WB	MW-97-15					132	ND	ND	ND	ND	ND	ND				
M-9T/WB	MW-97-16						8.3			ND	ND	ND	8.8	ND	ND	7.85
M-3SD							3030	2593	1969	2108.7	922	1060.8				
M-5SD	MW-97-27						5	10.1	ND	2.3		ND				
MW-97-1									263600	9350	59470	11850				

TABLE A4-1. HISTORICAL VOC AND SVOC CONCENTRATIONS AT SITE WELLS

Overburden Wells	Replacement Well	8/88,9/88 Total SVOCs (ppb)	4/94 Total SVOCs (ppb)	10/94 Total SVOCs (ppb)	3/95 Total SVOCs (ppb)	4/95 Total SVOCs (ppb)	8/97,9/97,10/97 Total SVOCs (ppb)	8/98,9/98,10/98 Total SVOCs (ppb)	02/00 - 05/00 Total SVOCs (ppb)	04/01 - 07/01 Total SVOCs (ppb)	04/02 - 07/02 Total SVOCs (ppb)	04/03 - 06/03 Total SVOCs (ppb)	03/04 - 05/04 Total SVOCs (ppb)	06/05 Total SVOCs (ppb)	10/06 Total SVOCs (ppb)	08/07 - 10/07 Total SVOCs (ppb)
MW-97-2												6.1				
MW-97-28									37750	7725	3254	2931				
MW-97-29										15.5	ND	ND	ND	ND	1.46	8.16
MW-97-30										5371	657	972.8				
MW-97-31									790	ND	ND	ND	ND	ND		801 21
MW-97-32									2498	3977	1752	1272	3579	805	2663	1626 83
MW-98-1									9660	3766	9610	7790				
EW-1			78	62	34	46										
EW-3			12127	581	10230	7967	5166	3455	1643	1409.6	637	730	675	1165	822	839
EW-4	EW-4A		1119	1915	681	267	26.4	6.4	ND	ND	ND		198.3	735	197.7	469
EW-5			2516	4884	1859	531	327.6	178.9	85.7	60.7	26.33	30.3	2280	51.1	33	23.6
EW-6			4073	ND	4400	4511	4800	2885	655.8	3715	3139	2202	ND	4370	2661	1028
EW-7								471.8	120.7	66.7	18	23.1	24	27.8	ND	20.69
EW-8									9534	7667	3190	3613	4003	6930	3885.7	5710
EW-9															ND	29.9
Area C (north of plume)																
BM-14	MW-97-19	250				ND	ND	ND	ND	ND	ND	ND				
BM-31B				ND		ND	ND	ND	ND			2.4	ND	ND	ND	9.58
909A		ND	ND			ND										
910A			ND			ND		ND	ND	ND	ND	ND				
910B			2			ND	ND	ND	ND							
911A										ND	ND	ND	ND	ND	ND	1.43
911B		34				ND	ND	3.6	ND	ND	ND	ND				
912A	MW-97-8	27	ND	ND		ND	ND	ND	ND							
913A							ND	ND	ND	ND	ND	ND				
919							ND	ND	ND	ND	ND	ND	ND	ND		
M-2SD							5.4	ND	ND							
M-7SD				ND		ND	ND	ND	ND	ND	ND	ND				
M-7T/WB							ND	ND	ND	ND	ND	ND				
M-8SD			4	ND		ND	ND	ND	ND			ND				
M-8T/WB							ND					ND				
EW-2			91	8870	ND	79	76.8	ND	ND	7.5	ND	ND	ND	ND		
Area D (south of plume)																
BM-15B											ND	ND				
912B	MW-97-9	ND	ND	ND		ND	ND	123 1	ND	ND	ND	ND	2.4			
M-6T/WB							5.5	ND		ND	ND	ND				
M-11SD			7	ND		ND										

TABLE A4-1. HISTORICAL VOC AND SVOC CONCENTRATIONS AT SITE WELLS

Overburden Wells	Replacement Well	8/88,9/88 Total SVOCs (ppb)	4/94 Total SVOCs (ppb)	10/94 Total SVOCs (ppb)	3/95 Total SVOCs (ppb)	4/95 Total SVOCs (ppb)	8/97,9/97,10/97 Total SVOCs (ppb)	8/98,9/98,10/98 Total SVOCs (ppb)	02/00 - 05/00 Total SVOCs (ppb)	04/01 - 07/01 Total SVOCs (ppb)	04/02 - 07/02 Total SVOCs (ppb)	04/03 - 06/03 Total SVOCs (ppb)	03/04 - 05/04 Total SVOCs (ppb)	06/05 Total SVOCs (ppb)	10/06 Total SVOCs (ppb)	08/07 - 10/07 Total SVOCs (ppb)
M-12SD						ND			ND	ND	ND	ND				
M-12T/WB									ND	ND	ND	ND				
Area E (west of plume - upgra																
920									ND	ND	ND					
Bedrock Wells	**Replacement Well**															
Area A (east side of river)																
901						23										
903		0														
BM-13		122				9										
M-10BR			1	67		2	ND	ND	ND	ND	ND	ND				
Area B (plume wells)																
902-1		6180														
902-2		590														
904		0														
M-4BR						ND			ND	ND	ND	ND				
Area C (north of plume)																
909	MW-97-5	ND	3			ND	ND	ND	ND	ND	ND	ND				
910		ND	ND	ND		ND										
911	MW-97-6	159				ND	15	2.8	ND		ND	ND				
913		75				ND	ND	ND	ND	ND	ND	ND				
M-7BR				ND		ND	ND	ND	ND		ND	ND				
M-8BR			ND	2		ND	ND	ND	ND	ND	ND	ND				
Area D (south of plume)																
905		33				ND										
912	MW-97-7	32	ND	ND		ND	ND	ND	ND	ND	ND	ND				
M-6BR						ND	4.2	3.3		ND	ND	ND				
M-12BR				ND		2			ND	ND	ND	ND				
Area E (west of plume - upgra																
908	MW-97-4	20	10													

Notes

SD: stratified drift

T: till

BR: bedrock

T/WB: till and weathered bedro

Maximum detected concentratic
selected for duplicate sample

ND: non-detect

Blank Space: not sampled

TABLE A4-2. HISTORICAL ARSENIC CONCENTRATIONS AT SITE WELLS

Overburden Wells	Replacement Well	Well Type	Arsenic Concentration (mg/L)																						
			1988	Q1/93	Q2/93	Q3/93	Q4/93	Q1/94	Q2/94	Q3/94	Q4/94	Q1/95	Q2/95	Q3/95	Q4/95	8/97 - 10/97	8/98 - 10/98	Q1/00	4/01 - 7/01	4/02 - 7/02	4/03 - 6/03	03/04 - 05/04	06/05	10/06	08/07 - 10/07
Area A (east side of river)																									
BM-7		SD								0.0053						0.012	0.0040	ND	ND	ND	ND				
BM-8		SD	ND	ND	0.073	ND	0.0040	ND	ND	ND			ND			0.0016	ND	ND	ND	ND	ND	ND	ND	ND	ND
BM-13B		SD		0.0060	0.11	0.017	0.010	0.0023	0.0022	0.0074		0.0055	ND		0.0030	0.0044	0.022	ND	ND	ND	ND	ND	ND	0.006	ND
BM-17		SD	0.019									0.014				0.0085	0.035	0.070	0.10	0.19	0.206				
BM-18R		SD	0.0030													0.014	0.013	0.0080	ND	ND	ND	0.074	ND	ND	ND
BM-20R		SD	ND	0.0070	0.17	0.011	0.040	0.0056	0.0044			0.0065	ND		0.0056	0.0028	0.0091	0.0090	0.64	ND	ND				
BM-21		SD														0.0060	0.0032	ND	ND	ND	ND				
BM-23R		SD	ND													0.0031	ND	ND	ND	ND	ND				
901A		SD														0.0016	ND	ND	ND	ND	ND				
903B		SD	0.017									0.053			0.28	0.0048	0.090	0.016			0.0043				
915A	MW-97-13	T														0.0048	ND	ND	ND	ND	ND	ND	ND	ND	ND
915B	MW-97-14	SD													0.026	0.074	0.041	0.022	0.010	ND	0.010				
M-10T/WB		T/WB		0.0050	0.020	0.020	0.020	0.031	0.012	0.0085		0.0072	ND			0.0016	0.0081	0.011							
Area B (plume wells)																									
BM-2	MW-97-17	SD														0.61	0.82		0.55	0.47	0.451	0.39	0.252	0.408	0.222
BM-4A		SD	2.8																						
BM-10	MW-97-18	SD															0.26	0.46	0.072	0.019	0.0215	0.008	ND	0.006	0.012
BM-30		SD	0.10									0.042			0.059										
BM-32B	MW-97-20	SD															0.36	0.10	0.008	ND	ND				
BM-34A	MW-97-21	SD														2.6	2.1	1.6	2.1	2.2	1.96	1.31			
BM-34B	MW-97-22	SD														1.8	0.62	0.40	0.35	0.32	0.224	0.353			
BM-35	MW-97-23	SD														1.1	2.1	1.1	0.96	0.82	0.619				
BM-37	MW-97-24	SD	ND													2.8	6.8	1.2	0.51	0.53	0.28				
BM-38	MW-97-25	SD								0.040		0.074				0.014	0.014	0.0070	0.011	ND	0.0056	0.0096			
902A	MW-97-3	SD	0.0032														0.37	0.70	0.27	0.25	0.181				
902B		SD	0.0020																						
904B		SD	ND																						
914C	MW-97-12	SD	0.0039													2.7	1.6	0.60	0.42	0.33	0.365	0.577	0.502	0.521	0.267
914B	MW-97-11	SD	0.0036													1.4	0.54	0.36	0.22	0.17	0.138				
914A	MW-97-10	T														0.029	1.6	0.0090	0.014	ND	0.0131	0.0132			
M-1T/WB	MW-97-15	T/WB														0.032	0.024	0.0060	ND	ND	ND				
M-9T/WB	MW-97-16	T								ND		ND	ND			1.4			ND	ND	0.0063	0.004	ND	ND	ND
M-3SD		SD														2.0	1.4	1.0	ND	0.7	0.462				
M-5SD	MW-97-27	SD														0.56	0.63	0.39	0.41		0.229				

TABLE A4-2. HISTORICAL ARSENIC CONCENTRATIONS AT SITE WELLS

Overburden Wells	Replacement Well	Well Type	Arsenic Concentration (mg/L)																				
			1988	Q1/93	Q2/93	Q3/93	Q4/93	Q1/94	Q2/94	Q3/94	Q4/94	Q1/95	Q2/95	Q3/95	Q4/95	8/97 - 10/97	8/98 - 10/98	Q1/00	4/01 - 7/01	4/02 - 7/02	4/03 - 6/03	03/04 - 05/04	06/05	10/06	08/07 - 10/07
MW-97-1		SD																0.36	0.86	0.66	1.18				
MW-97-2		SD																			0.255				
MW-97-28		SD																2.0	0.79	1.50	2.42				
MW-97-29		SD																	0.061	0.054	0.0467	0.0527	0.0342	0.051	0.0287
MW-97-30		SD																	0.42	1.20	0.791				
MW-97-31		SD																0.088	ND	ND	ND	ND	ND	ND	0.0368
MW-97-32		SD																0.071	0.080	0.028	0.0346	0.115	0.0294	0.136	0.0494
MW-98-1		SD																0.24	0.27	0.28	0.25				
EW-1		T/WB						0.063		0.061	0.086	0.036	0.046	0.028											
EW-3		SD						2.4		2.5	1.9	1.8	1.4	1.6	1.6		1.3	1.1	0.94	0.83	0.796	0.754	0.614	0.605	0.549
EW-4	EW-4A	T/WB						0.19		0.23	0.27	0.22	0.15	0.19	0.20		0.27	0.19	0.18	0.17		0.541	0.574	0.55	0.493
EW-5		SD						1.1		0.97	0.75	0.84	0.67	0.68	0.66		0.60	0.39	0.31	0.29	0.282	0.267	0.228	0.459	0.204
EW-6		SD						1.1		1.4	0.93	1.4	0.68	0.79	0.31		0.73	0.82	0.65	0.6	0.604	0.575	0.424	0.598	0.393
EW-7		SD															1.3	0.76	0.63	0.55	0.458	0.41	0.343	0.465	0.352
EW-8		SD																0.79	0.62	0.52	0.488	0.482	0.403	0.433	0.392
EW-9		SD																						0.022	0.157
Area C (north of plume)																									
BM-14	MW-97-19	SD	0.012									0.0060				0.0061	0.0036	ND	ND	ND	ND				
BM-31B		SD								2.0		1.6			1.9		2.0	0.21			1.18	1.99	1.97	2.09	1.76
909A		SD	0.0040	0.0060	0.062	0.013	0.0090	0.0025	0.014			ND													
910A		T		0.010	0.011	0.0050	ND	ND	0.0027	ND		ND	ND		ND		0.021	ND	ND	ND	ND				
910B		SD		0.0060	0.011	0.0080	ND	ND	0.0096	0.0023		ND			ND	0.0071	0.011	ND							
911A		T																	ND	ND	ND	ND	ND	ND	ND
911B		SD	0.090													0.46	0.064	0.038	ND	ND	0.0081				
912A	MW-97-8	SD	ND	0.0020	0.0010	ND	ND	ND	ND	ND		ND			ND	0.0031	ND	ND							
913A		SD	0.0030							0.0044		ND				0.0016	0.0036	ND	ND	ND	ND				
919		SD								3.1						3.5	3.8	1.9	1.7	2.5	1.79	ND	1.76		
M-2SD		SD															0.041	0.038							
M-7SD		SD		0.0050	0.028	0.011	0.0050	ND	ND	0.0024		ND	0.0040		0.0038	0.0031	ND	ND	ND	ND	ND				
M-7T/WB		T/WB		0.0040	0.0080	0.0040	ND	ND	ND	0.0028			ND			0.0035	ND	ND	ND	ND	ND				
M-8SD		SD		0.0030	0.0010	0.0040	0.0030	ND	ND	0.0034		ND			ND	0.0079	ND	ND			ND				
M-8T/WB		T/WB		ND	0.0080	0.0040	ND	ND	ND	ND			ND			0.0031					ND				
EW-2		SD						0.062		0.057	0.034	0.039	0.043	0.048	0.070		0.025	0.085	0.042	0.16	0.144	0.0751	0.07		
Area D (south of plume)																									
BM-15B		T																	ND	ND	ND				
912B	MW-97-9	SD	ND	0.0080	0.026	0.035	0.093	0.015	0.021	0.0070		0.0078			2.1	0.0033	0.0034	ND	ND	ND	ND	ND			
M-6T/WB		T/WB														0.0016	ND		ND	ND	ND				
M-11SD		SD																							

TABLE A4-2. HISTORICAL ARSENIC CONCENTRATIONS AT SITE WELLS

Overburden Wells	Replacement Well	Well Type	Arsenic Concentration (mg/L)																					
			1988	Q1/93	Q2/93	Q3/93	Q4/93	Q1/94	Q2/94	Q3/94	Q4/94	Q1/95	Q2/95	Q3/95	Q4/95	8/97 - 10/97	8/98 - 10/98	Q1/00	4/01 - 7/01	4/02 - 7/02	4/03 - 6/03	03/04 - 05/04	06/05	10/06	08/07 - 10/07
M-12SD		SD							0.10									ND	ND	ND	ND				
M-12T/WB		T/WB																ND	ND	ND	ND				
Area E (west of plume - upgradient)																									
920		SD																0.0060	ND	ND					
Bedrock Wells	**Replacement Well**																								
Area A (east side of river)																									
901		BR										0.0061			ND										
903		BR																							
BM-13		BR																							
M-10BR		BR		0.0040	ND	ND	0.0050	ND	ND	ND		ND	ND		ND	0.0016	0.0061	ND	ND	ND	ND				
Area B (plume wells)																									
902-1		BR																							
902-2		BR																							
904		BR	ND																						
M-4BR		BR																ND	ND	ND	ND				
Area C (north of plume)																									
909	MW-97-5	BR	ND	ND	0.0040	0.0050	ND	ND	ND			ND				0.0031	ND	ND	ND	ND	ND				
910		BR	ND	0.0030	0.011	0.0060	ND	ND	0.0036	ND		ND	0.0040		0.0058										
911	MW-97-6	BR														0.0077	0.0076	ND		ND	0.0076				
913		BR	0.0070							0.0036		ND		ND		0.0027	ND	ND	ND	ND	ND				
M-7BR		BR		0.0030	0.0010	ND	0.0050	ND	ND	ND		ND	ND		ND	0.0031	ND	ND		ND	ND				
M-8BR		BR		0.0010	0.0080	ND	ND		ND	0.0024		ND	ND		ND	0.0031	ND	ND	ND	ND	ND				
Area D (south of plume)																									
905		BR	ND									0.011			0.0053										
912	MW-97-7	BR	ND	ND	0.0010	ND	ND	ND	ND	ND		ND				0.0048	0.0046	ND	ND	ND	ND				
M-6BR		BR							0.0023							0.0095			ND	ND	ND				
M-12BR		BR																ND	ND	ND	ND				
Area E (west of plume - upgradient)																									
908	MW-97-4	BR		0.012	0.0010			ND																	

Notes

SD: stratified drift

T: till

BR: bedrock

T/WB: till and weathered bedrock

Maximum detected concentration selected for duplicate samples.

ND: non-detect

Blank Space: not sampled

ATTACHMENT 5
RECOMMENDATIONS FOR FUTURE MONITORING

Table A5. Recommendations for For Future Monitoring

Frequency:			
Activity/Analysis:		MNA Param. 1	
GROUNDWATER			
Overburden Wells	**Replacement Wells**		
Area A (east side of river)			
BM-7		●	
BM-8		●	
BM-13B		●	
BM-17		●	
BM-20R		●	
BM-23R		●	
901A		●	
915A	MW-97-13	●	
915B	MW-97-14	●	
Area B (plume wells)			
BM-2	MW-97-17	●	
BM-34A	MW-97-21	●	
BM-34B	MW-97-22	●	
BM-35	MW-97-23	●	
BM-37	MW-97-24	●	
BM-38	MW-97-25	●	
902A	MW-97-3	●	
914C	MW-97-12	●	
914B	MW-97-11	●	
914A	MW-97-10	●	
M-1T/WB	MW-97-15	●	
M-3SD		●	
M-5SD	MW-97-27	●	
MW-97-1		●	
MW-97-28		●	
MW-97-29		●	
MW-97-30		●	
MW-97-31		●	
MW-97-32		●	
MW-98-1		●	
EW-3		●	
EW-4		●	
EW-5		●	
EW-6		●	
EW-7		●	
EW-8		●	

Table A5. Recommendations for For Future Monitoring

Frequency:			
Activity/Analysis:		MNA Param. [1]	
Area C (north of plume)			
BM-14	MW-97-19	●	
BM-31B		●	
910A		●	
911B		●	
913A		●	
919		●	
M-7SD		●	
M-7T/WB		●	
M-8SD		●	
M-8T/WB		●	
EW-2		●	
Area D (south of plume)			
912B	MW-97-9	●	
Area E (west of plume - upgradient)			
920		●	
Bedrock Wells	**Replacement Well**		
Area A (east side of river)			
M-10BR		●	
Area B (plume wells)			
M-4BR		●	
Area C (north of plume)			
911	MW-97-6	●	
913		●	
M-7BR		●	
M-8BR		●	
Area D (south of plume)			
912	MW-97-7	●	
M-12BR		●	
	Total Number of Wells:	56	

1. It is recommended that MNA analyses be performed every 5 years until LNAPL thicknesses have dissipated to continuously less than 2 inches. At

MNA Param. - Monitored natural attenuation parameters (including chloride, sulfate, nitrate/nitrite N, ammonia N, total Kjedahal N, phosphate, chemi
ferrous iron, methane, ethane, ethene)

BTEX compounds - Benzene, Toluene, Ethylbenzene, Xylenes

Table A5. Recommendations for For Future Monitoring

Frequency:			Every 2 Years					Every 5 Years		
Activity/Analysis:	VOCs	PAHs	Pesticides	TOC/TCO	Grain Size	PAHs	Pesticides	Lipid Content	Fish Scales	
COCHATO RIVER SEDIMENT/BANK SOIL										
River Locations:										
Site A		●	●	●	●					
Site B		●	●	●	●					
Site C		●	●	●	●					
Site D		●	●	●	●					
Site E	●	●	●	●	●					
Bank Locations:										
Site C		●	●	●	●					
Site D		●	●	●	●					
FISH TISSUE										
Site A						●	●	●	●	
Site B						●	●	●	●	
Site C						●	●	●	●	
Site D						●	●	●	●	
Sylvan Lake						●	●	●	●	

ATTACHMENT 6
SITE INSPECTION AND INTERVIEW FORMS

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Baird & McGuire Superfund Site	**Date of inspection:** June 23, 2009
Location and Region: Holbrook, MA/Region I	**EPA ID:** MAD001041987
Agency, office, or company leading the five-year review: USEPA, Region I	**Weather/temperature:** Overcast, light rain/ mid 60s

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☒ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other _____
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** __Patrick Hurley, MassDEP_____ Environmental Engineer June 23, 2009
   Name Title Date
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☒ Report attached _____

2. **O&M staff** Kandi Prentiss, Pete Prentiss. GWTF Operators June 23, 2009
   Name Title Date
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; _Equipment is old, wearing out, but maintained as needed. Kandi Prentiss showed the author the O&M manual updates, location of inspection records and OSHA monitoring and training records.

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency	Name	Title	Date	Phone no.
MassDEP	Dorothy Allen	Project Manager	June 23, 2009	(617) 292-5795

Problems; suggestions; ☒ Report attached _____

Agency	Name	Title	Date	Phone no.

Problems; suggestions; ☐ Report attached _____

Agency	Name	Title	Date	Phone no.

Problems; suggestions; ☐ Report attached _____

Agency	Name	Title	Date	Phone no.

Problems; suggestions; ☐ Report attached _____

4. **Other interviews** (optional) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - ☒ O&M manual — ☒ Readily available — ☒ Up to date — ☐ N/A
   - ☒ As-built drawings — ☒ Readily available — ☐ Up to date — ☐ N/A
   - ☐ Maintenance logs — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks_____

2. **Site-Specific Health and Safety Plan** — ☒ Readily available — ☒ Up to date — ☐ N/A
   - ☐ Contingency plan/emergency response plan — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks_____

3. **O&M and OSHA Training Records** — ☒ Readily available — ☒ Up to date — ☐ N/A

   Remarks_____

4. **Permits and Service Agreements**
   - ☐ Air discharge permit — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Effluent discharge — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Waste disposal, POTW — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Other permits_____ — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks_____

5. **Gas Generation Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks_____

6. **Settlement Monument Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks_____

7. **Groundwater Monitoring Records** — ☒ Readily available — ☒ Up to date — ☐ N/A

   Remarks_____

8. **Leachate Extraction Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks_____

9. **Discharge Compliance Records**
   - ☐ Air — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☒ Water (effluent) — ☒ Readily available — ☒ Up to date — ☐ N/A

   Remarks_____

10. **Daily Access/Security Logs** — ☒ Readily available — ☒ Up to date — ☐ N/A

    Remarks_____

IV. O&M COSTS

1. **O&M Organization**

☒ State in-house ☒ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other_____

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate_____ ☐ Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A
Remarks Fencing had been damaged by plow has been repaired._____

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
Remarks_____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented * ☒ Yes ☐ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____
Frequency _____
Responsible party/agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date ☐ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☐ No ☐ N/A
Other problems or suggestions: ☐ Report attached

_____
__* ICs have not yet been implemented. _____

2. **Adequacy** ☐ ICs are adequate ☐ ICs are inadequate ☒N/A
Remarks: ICs have not yet been implemented.

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks_____

2. **Land use changes on site** ☒ N/A
Remarks_____

3. **Land use changes off site** ☒ N/A
Remarks_____

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks_____

B. Other Site Conditions

Remarks _____

_____

_____

_____

_____

_____

VII. LANDFILL COVERS ☐ Applicable ☒N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____
   _____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____
   _____

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks_____
   _____

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent_____ Height_____
   Remarks_____
   _____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent_____
☐ Ponding ☐ Location shown on site map Areal extent_____
☐ Seeps ☐ Location shown on site map Areal extent_____
☐ Soft subgrade ☐ Location shown on site map Areal extent_____
Remarks_____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches ☐ Applicable ☒ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

C. Letdown Channels ☐ Applicable ☒ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ ☐ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations ☐ Applicable ☒ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks_____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks_____

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

1. **Gas Treatment Facilities**
   ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   ☐ Good condition ☐ Needs Maintenance ☐ N/A
   Remarks_____

F. Cover Drainage Layer ☐ Applicable ☒ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
   Remarks_____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
   Remarks_____

G. Detention/Sedimentation Ponds ☐ Applicable ☒N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
   ☐ Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   ☐ Erosion not evident
   Remarks_____

3. **Outlet Works** ☐ Functioning ☐ N/A
   Remarks_____

4. **Dam** ☐ Functioning ☐ N/A
   Remarks_____

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
   ☐ Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   ☐ Performance not monitored
   Frequency_____ ☐ Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☒ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   ☒ Good condition ☒ All required wells properly operating ☐ Needs Maintenance ☐ N/A
   Remarks: Wells are generally in good condition, however, operators noted that equipment is aging and needs regular maintenance.

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ☒ Good condition ☐ Needs Maintenance
   Remarks: Equipment is generally in good condition, however, operators noted that equipment is aging and needs regular maintenance.

3. **Spare Parts and Equipment**
   ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
   Remarks: A large inventory of spare parts is not maintained on-site since there are redundant process pumps and most parts for most equipment can be obtained relatively quickly.

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps, and Electrical**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
   Remarks_____

C. Treatment System ☒ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
   ☒ Metals removal ☒ Oil/water separation ☐ Bioremediation
   ☐ Air stripping ☒ Carbon adsorbers
   ☒ Filters_____
   ☒ Additive (*e.g.*, chelation agent, flocculent): potassium permanganate and polymer
   ☒ Others: Biofilter, used as aeration tank
   ☐ Good condition ☐ Needs Maintenance *
   ☒ Sampling ports properly marked and functional
   ☐ Sampling/maintenance log displayed and up to date
   ☒ Equipment properly identified
   ☐ Quantity of groundwater treated annually_____
   ☐ Quantity of surface water treated annually_____
   Remarks * Major equipment is aging, and requires a fair amount of maintenance. The operators have repaired and upgraded a number of systems, including tanks, piping, and instrumentation.

2. **Electrical Enclosures and Panels** (properly rated and functional)
   ☐ N/A ☒ Good condition ☐ Needs Maintenance
   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   ☐ N/A ☐ Good condition* ☒ Proper secondary containment ☒ Needs Maintenance
   Remarks: Tanks are aging, and require a fair amount of maintenance. They are generally maintained in good condition due to repairs, however consideration should be given to replacing some of the tanks if the facility is to remain in operation for the long term.

4. **Discharge Structure and Appurtenances**
   ☐ N/A ☒ Good condition ☐ Needs Maintenance
   Remarks_____

5. **Treatment Building(s)**
   ☐ N/A ☒ Good condition (esp. roof and doorways) ☐ Needs repair
   ☒ Chemicals and equipment properly stored
   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☐ Good condition
   ☐ All required wells located ☐ Needs Maintenance ☐ N/A
   Remarks: Monitoring wells that were observed were properly secured.

D. Monitoring Data

1. Monitoring Data
   ☒ Is routinely submitted on time ☒ Is of acceptable quality

2. Monitoring data suggests:
   ☒ Groundwater plume is effectively contained ☒ Contaminant concentrations are declining *
   * with the exception of arsenic.

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks MNA is not being done

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).
The remedy for OU-1 (groundwater) appears effective in treating groundwater and containing the plume. As reported by the O&M team, decreasing trends for many contaminants are evident for all contaminants except arsenic.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.
The current protectiveness for OU-1 appears intact due to the continual operation of the GWTF. Long-term protectiveness will be met with the operation of the GWTF. Additional data is needed to determine when the GWTF can be taken off-line. Arsenic in the groundwater does not appear the be decreasing. One issue for continuing effectiveness is the age of much of the equipment. The O&M team has replaced, repaired, or upgraded many components, however, due to the age of the facility, a high level of maintenance will be an ongoing issue.

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. The GWTF is old and requires a fairly high level of maintenance. The O&M team is doing an exemplary job of proactively addressing issues with aging equipment, therefore it does not appear that the effectiveness of the remedy will be compromised.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. The O&M team has implemented a phased approach for optimizing the GWTF. A number of repairs and improvements have been made over the past 5 years (see report text for details). Additional opportunities to optimize the operations are being assessed by the O&M team, including the installation of a new extraction well in the vicinity of EW-9 and installation of a VFD on the aeration tank blower. A pilot test using greensand was conducted to determine whether greensand could be used as an alternative to the aeration tank, but it was determined not to be sufficiently effective.

INTERVIEW RECORD

Site Name: Baird & McGuire		**EPA ID No.: MAD001041987**
Subject: Groundwater Treatment (OU1)		**Time: 10:00** **Date: 6/23/09**
Type: ☐ Telephone ☒ Visit ☐ Other **Location of Visit:**		☐ Incoming ☐ Outgoing
Contact Made By:		
Name: Cinthia McLane	**Title: Project Manager**	**Organization: AECOM**
Individual Contacted:		
Name: Dorothy Allen	**Title: Project Manager**	**Organization: MassDEP**
Telephone No: (617) 292-5795 **Fax No:** **E-Mail Address: dorothy.t.allen@state.ma.us**		**Street Address: One Winter St.** **City, State, Zip: Boston, MA 02108**

Summary Of Conversation

(Note – MassDEP is currently the lead agency for the site and maintains a full-time presence.)

1. What is your overall impression of the project? (general sentiment)

   Ms Allen said the GWTF equipment has outlived its functional life and she would like to know whether EPA envisions providing states with the resources to upgrade such equipment. She is waiting to hear from EPA on how long the MassDEP will be operating the plant. Is the remedy achievable?

2. Is the remedy functioning as expected? How well is the remedy performing?

   Ms Allen said that the remedy is functioning well due to efforts of Mr. Hurley of MassDEP and the O&M contractor; however, she believes that ash that was backfilled onsite during OU2 is functioning as a continuing source of arsenic. Standards for VOCs and SVOCs are being met, but arsenic plume is not decreasing in size or concentration. The plume is being contained.

3. Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

   A number of modifications to optimize the facility have been made. Of particular note is changing carbon backwash water source from T-16 (filter feed tank) to T-17 (treated effluent). This modification has resulted in increased carbon life.

4. Have there been any security issues in the last 5 years?

   No security issues.

5. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office? If so, please give details of the events and results of the responses.

A neighbor at the northern end of the Site wants to move the fence so that they can develop their land. MassDEP told them they need to sample the soil before fence can be moved. This property owner has refused to give MassDEP access to their site to sample.

One of the original Site owners wants to develop the portion of the land where the LNAPL building is located.

Ms. Allen said that it would be helpful to have the ICs in place to address access issues and development requests, and to enforce restrictions.

One of the Holbrook Selectmen who walks her dog on the other side of the river complained that the GWTF was discharging to the river. She was invited to the GWTF and was shown the recharge basins where the treated groundwater is discharged. The Selectman also complained about noise from the aeration tank blower, but the noise was found to come from a neighboring paint facility (input on this was also provided by Mr. Patrick Hurley of the MassDEP).

6. Please describe any community involvement activities.

When the MassDEP first assumed responsibility for the Site, they held a Citizen's Task Force Meeting to address community concerns that GWTF O&M would be discontinued. The DEP has contacted the Task Force about a possible second meeting, but there is no apparent community interest.

7. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

Ms Allen commented that, because the State has taken over the Site, the EPA cannot "just hang up their hat". She said that the EPA should revisit the cleanup standards and evaluate how long they need to continue operating the GWTF. She said that the ROD says that in 5 years the EPA has to evaluate whether cleanup standards can be met, noting that this is a policy issue that has not been addressed.

INTERVIEW RECORD

Site Name: Baird & McGuire		**EPA ID No.: MAD001041987**
Subject: Groundwater Treatment (OU1)		**Time: 10:00** **Date: 6/23/09**
Type: ☐ Telephone ☒ Visit ☐ Other **Location of Visit: Baird & McGuire GWTF, Holbrook, MA**		☐ Incoming ☐ Outgoing
Contact Made By:		
Name: Cinthia McLane	**Title: Project Manager**	**Organization: AECOM**
Individual Contacted:		
Name: Patrick Hurley	**Title: Environmental Engineer**	**Organization: MassDEP**
Telephone No: (617) 292-5641 **Fax No: (617) 556-1049** **E-Mail Address: patrick.hurley@state.ma.us**		**Street Address: One Winter St.** **City, State, Zip: Boston, MA 02108**

Summary Of Conversation

1. Is the remedy functioning as expected? How well is the remedy performing?

The GWTF operates well, however, the State/O&M contractor are continually doing upgrades due to old equipment wearing out. A 4 phase approach has been used for repairs and upgrades. Phase 1 included repairs needed immediately upon taking over the plant in 2004 to replace worn-out equipment and to make modifications needed for unattended operation. Phase 2 included upgrades needed to address safety. Phase 3 included equipment and energy efficiency upgrades. Phase 4, which is ongoing, includes optimizing wellfield and increasing extraction system efficiency.

2. What does the monitoring data show? Are there any data trends that appear unusual?

Overall, the remedy is performing OK.

3. Have there been unexpected O&M difficulties or costs at the site in the last five years? If so, give details.

Due to age of equipment, a number equipment repairs and upgrades were required. Several tanks, mixers, and piping repairs or replacement were required. Ultrasonic testing revealing tank wall corrosion on several tanks. The tank bottom of T-2 required replacing. Modifications to the GAC system were required to address clogging and decrease frequency of carbon replacement. More details on repairs and upgrades are included in the report text.

The LNAPL system is only operated intermittently because there has not been a lot of LNAPL to remove. Generally, the material is emulsified and doesn't separate well in the oil/water separator. The system is turned on when dissolved phase, seen as high levels of naphthalene, is detected in the GWTF.

4. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

Modifications to the SCADA system allowed for a reduction in the hours that facility is attended and a reduction in staff from 4 to 3. This resulted in a cost reduction, with no decrease in protectiveness or effectiveness of the remedy.

5. Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

A review of monitoring well data was conducted to optimize sampling effort. Wells in which contaminants had been non-detect for several years and wells in center of the plume were removed from plan, which resulted in a cost savings. In-plant sampling was also optimized. See response to question 1 and report text for O&M optimization.

6. Have there been any security issues in the last 5 years?

No security issues. A plow hit and damaged the site fence, but damage has been repaired.

7. Do you have any comments, suggestions or recommendations regarding the project?

Overall, facility is old, but operating OK.

ATTACHMENT 7
ARARS REVIEW

TABLE A7-1. POTENTIAL CHEMICAL-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE BAIRD & MCGUIRE SUPERFUND SITE - OPERABLE UNITS 1 AND 2, HOLBROOK, MASSACHUSETTS

Media and Authority	Requirement	ROD Status	ROD requirements synopsis and consideration in RI/FS	Five-Year Review
Groundwater				
Federal Regulatory Requirements	SDWA - Maximum Contaminant Levels (MCLs) (40 CFR 141.11 - 141.16)	Applicable	Maximum Contaminant Levels (MCLs) have been promulgated for a number of common organic and inorganic analytes. These levels regulate the concentration of analytes in public drinking water supplies, but may also be considered relevant and appropriate for groundwater aquifers used for drinking water. The Holbrook Municipal South Street well field was closed due to Baird & McGuire Site contamination. Private drinking water wells exist in the vicinity.	Although the municipal wells have been closed, the Site is located in a state-designated interim wellhead protection area. Drinking water rules are therefore relevant and appropriate. MCLs and non-zero MCLGs have the status of ARARs for areas surrounding the Baird & McGuire Site boundaries. Many of the MCLs and MCLGs have changed since ROD completion. MCLs/MCLGs for OU-1 are provided in Table A7-2. Since the first five-year review in 1999, the MCL for arsenic was lowered from 50 µg/l to 10 µg/l. Constituents in Site groundwater still exceed criteria for arsenic, lindane (gamma-BHC), heptachlor epoxide, VOCs, SVOCs, and the secondary MCL for iron. Groundwater treatment is currently being conducted. The treated groundwater is being discharged back to groundwater and meets the standards for this rule. Groundwater contamination remains, however, and treatment is expected to continue for several years. Groundwater requires continued remediation under this rule.

TABLE A7-1. POTENTIAL CHEMICAL-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE BAIRD & MCGUIRE SUPERFUND SITE - OPERABLE UNITS 1 AND 2, HOLBROOK, MASSACHUSETTS

Media and Authority	Requirement	ROD Status	ROD requirements synopsis and consideration in RI/FS	Five-Year Review
	RCRA - Subpart F, Groundwater Protection Standards, Concentration Limits (40 CFR 264.94(a))	Relevant and Appropriate	Standards for 14 toxic compounds have been adopted as part of RCRA groundwater protection standards. These limits were originally set at MCLs. The groundwater protection regulations require the setting of groundwater protection standards which must be protective of the public health and the environment. During the design of the groundwater interception and treatment system, restoration target levels were proposed based on existing data.	RCRA sets the limit for organic constituents at background levels. Constituents in Site groundwater exceed RCRA MCLs for arsenic and exceed background concentrations for all organic COCs. Groundwater treatment is currently being conducted. The treated groundwater is being discharged back to groundwater and meets the standards for this rule. Groundwater contamination remains, however, and treatment is expected to continue for several years. Groundwater still requires remediation under this rule.
Massachusetts Regulatory Requirements	Massachusetts Drinking Water Requirements (310 CMR 22.05 to 22.09)	Applicable	The Massachusetts Drinking Water Standards and Guidelines list Massachusetts Maximum Contaminant Levels (MMCLs) that apply to water delivered to any user of a public water supply system as defined by the rule.	The Site is located in a designated Mass. Wellhead Protection Area. Drinking water standards are applicable to groundwater supplies surrounding the Baird & McGuire Site. MMCLs for OU-1 are provided in Table A7-2. Constituents in Site groundwater still exceed criteria for arsenic, lindane (gamma-BHC), heptachlor epoxide, VOCs, and SVOCs. Groundwater treatment is currently being conducted. The treated groundwater is being discharged back to groundwater and meets the standards for this rule. Groundwater contamination remains, however, and treatment is expected to continue. Site groundwater requires continued remediation to protect outlying groundwater supplies.

TABLE A7-1. POTENTIAL CHEMICAL-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE BAIRD & MCGUIRE SUPERFUND SITE - OPERABLE UNITS 1 AND 2, HOLBROOK, MASSACHUSETTS

Media and Authority	Requirement	ROD Status	ROD requirements synopsis and consideration in RI/FS	Five-Year Review
Federal Criteria, Advisories, and Guidance	SDWA - Maximum Contaminant Level Goals (MCLGs)	Relevant and Appropriate/ To Be Considered	Maximum contaminant level goals (MCLGs) are health-based criteria that are to be considered for drinking water sources as a result of SARA. These goals are available for a number of organic and inorganic contaminants. Projected groundwater concentrations were compared to their MCLGs in documents supporting the ROD.	MCLs and non-zero MCLGs have the status of ARARs for areas outside of the Baird & McGuire Site boundaries. Zero MCLGs are criteria to be considered. Many of the MCLs and MCLGs have changed since ROD completion. MCLs/MCLGs for OU-1 are provided in Table A7-2. Groundwater requires continued remediation under this rule to protect outlying resources.
Discharge to Surface Water				
Massachusetts Regulatory Requirements	Massachusetts Surface Water Quality Standards (314 CMR 4.05)	Applicable	DEP Surface Water Quality Standards are given for dissolved oxygen, temperature increase, pH, and total coliform and there is a narrative requirement for toxicants in toxic amounts. In the absence of a state standard for a compound, federal AWQC would be appropriate. Requirements were considered; however, no numerical standards exist for contaminants found in Site groundwater which would be discharged to surface water. Federal AWQC will be used in the absence of narrative standards.	These regulations classify the surface waters of the Commonwealth according to the uses of those waters. The wetland has a Class A waterway classification. Class A waters are designated as habitat for fish, other aquatic and wildlife, and for primary and secondary contact recreation. The state surface water minimum criteria for Class A waters are consistent with federal AWQC. These rules are applicable to the Cochato River and unnamed brook. Although discharge is not directly to the Cochato River, federal AWQC have not been exceeded by the groundwater treatment effluent in the time since the last five-year review report. This ARAR is more appropriate as an Action-Specific ARAR and, as the groundwater discharge is not directly to a surface water body, should not be an ARAR.

TABLE A7-1. POTENTIAL CHEMICAL-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE BAIRD & MCGUIRE SUPERFUND SITE - OPERABLE UNITS 1 AND 2, HOLBROOK, MASSACHUSETTS

Media and Authority	Requirement	ROD Status	ROD requirements synopsis and consideration in RI/FS	Five-Year Review
Federal Criteria, Advisories, and Guidance	Federal Ambient Water Quality Criteria (AWQC)	Relevant and Appropriate	Federal AWQC are health-based and ecologically based criteria which have been developed for 95 carcinogenic and non-carcinogenic compounds. AWQC were considered in characterizing public health risks to aquatic organisms due to contaminant concentrations in surface water at Cochato River. Because this water is not used as a drinking water source, the criteria developed for aquatic organisms protection and ingestion of contaminated aquatic organisms were considered.	CERCLA Sec. 121 (d)(2)(A) Specifically states that remedial actions shall at least attain federal AWQC established under the Clean Water Act if they are relevant and appropriate. AWQC for protection of human health from ingestion of water and aquatic organisms are relevant and appropriate. Current AWQC are listed in Table A7-6. Although discharge is not directly to the Cochato River, federal AWQC have not been exceeded by the groundwater treatment effluent in the time since the last five-year review report. This ARAR is more appropriate as an Action-Specific ARAR and, as the groundwater discharge is not directly to a surface water body, should not be an ARAR.
Air				
Massachusetts Regulatory Requirements	Massachusetts - Air Quality, Air Pollution (310 CMR 6.00-8.00)	Formerly Applicable now Not ARAR	These standards were primarily developed to regulate stack and automobile emissions.	310 CMR 6.00 provide ambient air quality standards for the Commonwealth, standards for dust are contained in 310 CMR 7.09, and 310 CMR 7.08 provides incinerator standards. These standards were used in establishing discharge limits from the incinerator. The incinerator has been dismantled and these requirements are no longer applicable, relevant or appropriate. Should excavation occur in the future, dust control standards would need to be reconsidered. This ARAR is more appropriate as an Action-Specific ARAR.

TABLE A7-1. POTENTIAL CHEMICAL-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE BAIRD & MCGUIRE SUPERFUND SITE - OPERABLE UNITS 1 AND 2, HOLBROOK, MASSACHUSETTS

Media and Authority	Requirement	ROD Status	ROD requirements synopsis and consideration in RI/FS	Five-Year Review
Federal Criteria, Advisories, and Guidance	Threshold Limit Values (TLVs)	Formerly To Be Considered now Not ARAR	These standards were issued as consensus standards for controlling air quality in workplace environments. TLVs could be used to assess Site inhalation risks for soil removal operations.	The incinerator has been dismantled and these requirements are no longer applicable, relevant or appropriate. Should excavation be considered in the future, these values would need to be reconsidered. This ARAR is more appropriate as an Action-Specific ARAR.
Massachusetts Criteria, Advisories, and Guidance	Massachusetts Guidance on Acceptable Ambient Air Levels (AALs)	Formerly To Be Considered now Not ARAR	AALs were considered when assessing the significance of monitored and modeled residential contamination from air emissions.	The incinerator has been dismantled and these requirements are no longer applicable, relevant or appropriate. This ARAR is more appropriate as an Action-Specific ARAR.

TABLE A7-2. NUMERICAL STANDARDS FOR BAIRD & MCGUIRE GROUNDWATER

CHEMICAL [1]	SDWA MCL[2] (mg/L)	SDWA MCLG[3] (mg/L)	RCRA MCL[4] (mg/L)	Mass. Drinking Water Stds.[5] (mg/L)
Organics, Pesticides, PCBs				
Acenapthalene*, **	--	--	--	--
Aldrin	--	--	--	[7]
Benzene*	0.005	0	--	0.005
Benzidine	--	--	--	--
Benzo(a)pyrene	0.0002	0	--	0.0002
Butanone, 2-	--	--	--	--
Chlordane*	0.002	0	--	0.002
Chloroform	--	--	--	[7]
DDD, 4, 4-	--	--	--	--
DDE, 4, 4-	--	--	--	--
DDT, 4, 4-	--	--	--	--
Dibenzofuran*	--	--	--	--
Dichloroethane, 1, 2-	0.005	0	--	0.005
Dichloroethylene, 1,2-trans*	0.1	0.1	--	0.1
Dichloropropylene, 1,3-trans	--	--	--	--
Dieldrin*	--	--	--	[7]
Dimethylphenol, 2,4-*	--	--	--	--
Dioxin (2, 3, 7, 8-TCDD)	$3x10^{-8}$	0	--	$3x10^{-8}$
Ethylbenzene*	0.7	0.7	--	0.7
Fluoranthene	--	--	--	--
Fluorene*, **	--	--	--	--
Heptachlor	0.0004	0	--	0.0004
Heptachlor epoxide	0.0002	0	--	0.0002
Lindane (gamma-BHC)	0.0002	0.0002	0.004	0.0002

TABLE A7-2. NUMERICAL STANDARDS FOR BAIRD & MCGUIRE GROUNDWATER

CHEMICAL [1]	SDWA MCL[2] (mg/L)	SDWA MCLG[3] (mg/L)	RCRA MCL[4] (mg/L)	Mass. Drinking Water Stds.[5] (mg/L)
Methylnaphthalene, 2-*, **	--	--	--	--
Methylphenol, 4-*	--	--	--	--
Naphthalene*, **	--	--	--	[7]
Phenanthrene*, **	--	--	--	--
Total Other PAHs (**)	--	--	--	--
Tetrachloroethylene	0.005	0	--	0.005
Toluene*	1	1	--	1
Trichloroethane, 1,1,1-	0.2	0.20	--	0.2
Trichloroethylene (TCE)	0.005	0	--	0.005
Vinyl chloride	0.002	0	--	0.002
Xylenes (total)*	10	10	--	10
Inorganics				
Antimony	0.006	0.006	--	0.006
Arsenic*	0.010	0	0.05	0.010
Barium	2	2	1.0	2
Beryllium	0.004	0.004	--	0.004
Cadmium	0.005	0.005	0.01	0.005
Iron	--	0.3 (SMCL)	--	0.3 (SMCL)
Lead*	Treatment technique[6]	0	0.05	Treatment technique[6]
Nickel		--	--	--
Silver		0.10 (SMCL)	0.05	0.10 (SMCL)
Zinc		5 (SMCL)	--	5 (SMCL)

TABLE A7-2. NUMERICAL STANDARDS FOR BAIRD & MCGUIRE GROUNDWATER

Notes

1. Chemicals listed in this table include selected critical contaminants identified in Table 1 of the 9/30/86 ROD, indicator compounds as defined in the Site Maintenance Plan (see * below), and other compounds detected at levels exceeding SDWA MCLs during 2003 or 2007 groundwater monitoring.
2. National Primary Drinking Water Regulations under Safe Drinking Water Act (SDWA), 40 CFR Part 141, Subpart G, Maximum Contaminant Levels (MCLs)
3. National Primary Drinking Water Regulations under Safe Drinking Water Act, 40 CFR Part 141, Subpart F, Maximum Contaminant Level Goals (MCLGs)
4. Federal Resource Conservation and Recovery Act Maximum concentration of Constituents for Groundwater Protection, 40 CFR 264.94, Table 1.
5. Massachusetts Drinking Water Regulations, 310 CMR 22.00
6. The MCL for lead was replaced by an action level of 15 ppb (0.015 mg/L) at the tap, 0.005 mg/L in the system. Public water systems exceeding the action level must for further treatment; b) undertake a public education program to inform consumers about how to reduce exposure to lead in drinking level continues, replace all lead service pipes.
7. These compounds are identified as "unregulated inorganic and organic chemicals" requiring special monitoring (310 CMR 22.07C).

*These compounds are contamination indicator compounds as defined in the Site Maintenance Plan for the Baird & McGuire Groundwater Treatment Plant and Extraction/Recharge System" prepared by Metcalf & Eddy, April 25, 1989, for the U.S. Army Engineer District, Omaha.

**PAH compounds listed in Table 2 of 9/30/86 Record of Decision: 2-methylnapthalene, acenapthene, acenapthylene, anthracene, benzo(a)anthracene, benzo(b)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluorene, indeno(1, 2, 3-cd)pyrene, napthalene, phenanthrene, and pyrene.

SMCL – Secondary Maximum Contaminant Level

TABLE A7-3. POTENTIAL LOCATION-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE
BAIRD & MCGUIRE SITE (ALL OPERABLE UNITS), HOLBROOK, MASSACHUSETTS

SITE FEATURE AND AUTHORITY	REQUIREMENTS	ROD STATUS	REQUIREMENT SYNOPSIS AND CONSIDERATION IN RI/FS	FIVE-YEAR REVIEW
Wetlands				
Federal Regulatory Requirements	Clean Water Act (CWA) Section 404 – (40 CFR Part 230)	Applicable	Under this requirement, no activity that adversely affects a wetland shall be permitted if a practicable alternative that has less effect is available. Permits are required to be obtained from the US Army Corps of Engineers for dredge and fill activities in off-site wetlands. During identification, screening, and evaluation of alternatives, the effects on wetlands are evaluated. Wetland impacts must be avoided, minimized, mitigated.	To mitigate unavoidable wetland impacts, a Final Site Restoration Plan was developed that requires the restoration of approximately 7.4 acres of forested and scrub/shrub floodplain wetlands, including a small peat bog and 1,000 linear feet of intermittent stream, impacted by the remedial action. The plan required restoring the wetland to the approximate original grades and elevations, backfilling with organic topsoil (at least 20 percent organic matter by weight) and seeding and planting with appropriate herbaceous, shrub, and tree species. The wetland was monitored for four years in order to assess the success of the wetland restoration effort. The final monitoring report was completed in 2002.
	Executive Order, 11990; Wetlands Protection; Clean Water Act (40 CFR 6, Appendix A)	Applicable	Under this requirement, no activity that adversely affects a wetland shall be permitted if a practicable alternative that has less effect is available. All operable units include wetlands.	To mitigate unavoidable wetland impacts, a Final Site Restoration Plan was developed. The plan required the restoration of forested and scrub/shrub floodplain wetlands, including a small peat bog, and an intermittent stream impacted by the remedial action. The plan also required annual monitoring of the wetlands for at least three years following completion of the restoration efforts. Four years of monitoring data were collected and the final monitoring report was completed in 2002.

TABLE A7-3. POTENTIAL LOCATION-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE BAIRD & MCGUIRE SITE (ALL OPERABLE UNITS), HOLBROOK, MASSACHUSETTS

SITE FEATURE AND AUTHORITY	REQUIREMENTS	ROD STATUS	REQUIREMENT SYNOPSIS AND CONSIDERATION IN RI/FS	FIVE-YEAR REVIEW
	Fish and Wildlife Coordination Act (16 U.S.C. 661)	Applicable	The Fish and Wildlife Coordination Act (16 USC 661 *et. seq.*) requires that, before issuing a federal permit or undertaking any federal action that causes the impoundment (with certain exemptions), diversion, or other control or modification of any body of water, the applicable federal agency must consult with (1) the appropriate state agency exercising jurisdictions over wildlife resources; (2) the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service, within the Department of Interior; and (3) the National Marine Fisheries Service, within the Department of Commerce. The Baird & McGuire Site includes significant wetlands. This requirement is addressed under CWA Section 404.	Consultation occurred as part of the RI/FS process.
State Regulatory Requirements	Massachusetts – Wetlands Protection(310 CMR 10.00)	Applicable	These requirements are promulgated under Wetlands Protection Laws, which regulate dredging, filling, altering, or polluting wetlands. Work within 100 feet of a wetland is also regulated under this requirement. The requirement defines wetlands based on vegetation type and requires that effects on wetlands be mitigated. If alternatives require that work be completed within 100 feet of a defined wetland, these regulations are to be considered. Mitigation of impacts on wetlands is addressed under CWA 404.	To mitigate unavoidable wetland impacts, a Final Site Restoration Plan was developed. The plan required the restoration of forested and scrub/shrub floodplain wetlands, including a small peat bog, and an intermittent stream impacted by the remedial action. The plan also required annual monitoring of the wetlands for at least three years following completion of the restoration efforts. Four years of monitoring data were collected and the final monitoring report was completed in 2002.

TABLE A7-3. POTENTIAL LOCATION-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE BAIRD & MCGUIRE SITE (ALL OPERABLE UNITS), HOLBROOK, MASSACHUSETTS

SITE FEATURE AND AUTHORITY	REQUIREMENTS	ROD STATUS	REQUIREMENT SYNOPSIS AND CONSIDERATION IN RI/FS	FIVE-YEAR REVIEW
	Massachusetts Environmental Policy Act (MEPA) Regulations (301 CMR 11.00)	Formerly Applicable, Now not ARAR	These regulations require that all actions exceeding specified threshold established under MEPA, requiring funding, or requiring a major permit, prepare and file an Environmental Notification Form (ENF). MEPA has determined that the reports generated during Baird & McGuire investigations essentially constitute an Environmental Impact Report. During development of alternatives, impacts to wetlands and floodplains were evaluated.	The CERCLA process generates evaluations and reports that are equivalent to those required by MEPA. To eliminate redundancy, these rules are no longer considered ARAR.
	Department of Environmental Management (DEM) Inland Wetland Orders (302 CMR 6.00)	Applicable	Pursuant to these regulations, DEM has authority to adopt orders restricting activities or uses of inland wetlands in order to preserve and promote public safety, property, wildlife and water resources, and floodplain areas. DEM was apprised of remedial actions which may impact inland wetlands.	To mitigate unavoidable wetland impacts, a Final Site Restoration Plan was developed. The plan required the restoration of forested and scrub/shrub floodplain wetlands, including a small peat bog, and an intermittent stream impacted by the remedial action. The plan also required annual monitoring of the wetlands for at least three years following completion of the restoration efforts. Four years of monitoring data were collected and the final monitoring report was completed in 2002.
Floodplains				
Federal Regulatory Requirements	RCRA Location Standards 40 CFR 264.18(b)	Relevant and Appropriate	RCRA-defined listed or characteristic hazardous waste (40 CFR 261) facility must be designed, constructed, operated, and maintained to prevent washout by 100-year flood.	This ARAR has been met. All hazardous waste facilities are outside of the 100-year flood plain.

TABLE A7-3. POTENTIAL LOCATION-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE BAIRD & MCGUIRE SITE (ALL OPERABLE UNITS), HOLBROOK, MASSACHUSETTS

SITE FEATURE AND AUTHORITY	REQUIREMENTS	ROD STATUS	REQUIREMENT SYNOPSIS AND CONSIDERATION IN RI/FS	FIVE-YEAR REVIEW
	Floodplains Protection Executive Order 11988; Clean Water Act (40 CFR 6.302(b),Appendix A)	Applicable	Federal agencies shall take action to reduce the risk of flood loss, minimize the impact of floods on human safety, health and welfare, and restore and preserve the natural and beneficial values of floodplains. Federal agencies shall also evaluate potential effects of actions in floodplains and ensure consideration of flood hazards and floodplain management. If action is taken in floodplains, alternatives to avoid adverse effects, and minimize potential harm must be taken.	This ARAR has been met. The Site was re-graded according to plan and according to former floodplain delineation.
State Regulatory Requirements	Massachusetts Wetlands Protection (310 CMR 10.57 (2), 10.04)	Applicable	Actions in "bordering land subject to flooding" shall provide compensatory storage for flood storage volume lost as a result of the project, shall not restrict flows so as to cause an increase in flood stage or velocity, and shall not impair its capacity to provide important wildlife habitat functions or alter vernal pool habitat. Actions in "isolated land subject to flooding" shall not result in flood damage because of lateral displacement of water that would otherwise be confined within the area, adverse effects on water supply, adverse effects on the capacity of the area to prevent groundwater pollution, or adverse effects on vernal pool habitat.	This ARAR has been met. The site was re-graded according to plan and according to former floodplain delineation.

TABLE A7-3. POTENTIAL LOCATION-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE BAIRD & MCGUIRE SITE (ALL OPERABLE UNITS), HOLBROOK, MASSACHUSETTS

SITE FEATURE AND AUTHORITY	REQUIREMENTS	ROD STATUS	REQUIREMENT SYNOPSIS AND CONSIDERATION IN RI/FS	FIVE-YEAR REVIEW
	Massachusetts Hazardous Waste Management Rules, Facility Location Regulations (310 CMR 30.700-30.707)	Relevant and Appropriate	No new facility may be located in an area subject to flooding, within the watershed of class A or class SA segment of a surface water body (unless DEP determines these is no feasible alternative), on land overlying an actual planned, or potential public or private drinking water source, or in the flow path of groundwater supplying water to an existing well. Variances and exceptions are noted in the regulations. The impact of the construction and operation of an on-site hazardous waste treatment, storage or disposal facility on the floodplain must be considered during the development of remedial alternatives.	As there was no feasible alternative, the groundwater treatment facility was constructed at this Site. The groundwater treatment facility treats materials that may be classified as RCRA hazardous by toxicity. While these rules may be relevant, they are not appropriate based on the nature of the treatment (remediation).
	Massachusetts Certification for Dredging, Dredged Material Disposal and Filling in Waters (314 CMR 9.00)	Applicable	A water quality certification is required for any activity that involves dredging in a waterway or wetland in Massachusetts that is also subject to a U.S. Army Corps of Engineers CWA Permit, a EPA NPDES permit, or a Massachusetts Wetlands or Waterways Order of Conditions or License. Application must be made to DEP to certify that a proposed project will attain or maintain the Massachusetts Water Quality Standards and minimize adverse impacts to water quality.	To mitigate unavoidable wetland impacts, a Final Site Restoration Plan was developed. The plan required the restoration of forested and scrub/shrub floodplain wetlands, including a small peat bog, and an intermittent stream impacted by the remedial action. The plan also required annual monitoring of the wetlands for at least three years following completion of the restoration efforts. Four years of monitoring data were collected and the final monitoring report was completed in 2002. This work has been completed and substantive requirements have been attained.

TABLE A7-4. POTENTIAL ACTION-SPECIFIC ARARS FOR OPERABLE UNITS 1 AND 2 BAIRD & MCGUIRE SITE, HOLBROOK, MASSACHUSETTS

ARAR	REQUIREMENT SYNOPSIS AND STATUS	ACTION TAKEN TO ATTAIN ARARS	FIVE-YEAR REVIEW
Federal Regulatory Requirements			
RCRA - Generator Standards (40 CFR 261, 265.170 - 265.174, 262.10 - 262.34)	If contaminated substances meet the definition of RCRA-hazardous under 40 CFR 261, RCRA requirements are applicable. If contaminated substances at CERCLA sites are determined to be sufficiently similar to RCRA hazardous wastes, technical aspects of RCRA requirements are considered relevant and appropriate. If removed from their existing locations, hazardous substances should be handled, transported, and treated as RCRA hazardous waste. General generator requirements outline waste characterization, management of containers, packaging, labeling and manifesting. **ROD Status: ARAR** **5-Year Status: Relevant and Appropriate**	Treatment residuals from wastewater treatment will be disposed of according to RCRA. Waste containers will be handled and managed in accordance with RCRA.	These requirements are relevant and appropriate to operations at the groundwater treatment facility. Although the GWTP does not treat RCRA-designated hazardous waste, it does generate a treatment residual that may, at times, meet the definition of a RCRA hazardous waste. Generator requirements are therefore being complied with at the facility.

TABLE A7-4. POTENTIAL ACTION-SPECIFIC ARARS FOR OPERABLE UNITS 1 AND 2 BAIRD & MCGUIRE SITE, HOLBROOK, MASSACHUSETTS

ARAR	REQUIREMENT SYNOPSIS AND STATUS	ACTION TAKEN TO ATTAIN ARARS	FIVE-YEAR REVIEW
RCRA – Standards for Owners and Operators of Permitted Hazardous Waste Facilities (40 CFR 264.10 – 264.18)	If a facility operated pursuant to RCRA regulations, RCRA requirements are applicable. If contaminated substances at CERCLA sites are determined to be sufficiently similar to RCRA hazardous wastes, technical aspects of RCRA requirements are considered relevant and appropriate. If removed from their existing locations, hazardous substances should be handled, transported, and treated as RCRA hazardous waste. General facility requirements outline general waste analysis, security measures, inspections, and training requirements. **ROD Status: ARAR** **5-Year Status: Not ARAR**	All facilities on-site will be constructed, fenced, posted, and operated in accordance with this requirement. All workers will be properly trained. Process wastes will be evaluated for the characteristics of hazardous wastes to assess further requirements. Treatment residuals from wastewater treatment will be disposed of according to RCRA.	These requirements were relevant and appropriate to the incinerator. The incinerator has been dismantled. The groundwater treatment facility does not treat hazardous waste and does not meet the standards for being sufficiently similar to a hazardous waste treatment facility. These rules are no longer considered applicable, relevant or appropriate.
RCRA – Preparedness and Prevention (40 CFR 265.30-265.37)	This regulation outlines safety equipment and spill control requirements for hazardous waste facilities. Part of the regulation includes a requirement that facilities be designed, maintained, constructed, and operated so that the possibility of an unplanned release which could threaten public health or the environment is minimized. **ROD Status: ARAR** **5-Year Status: Relevant and Appropriate**	Safety and communication equipment will be installed at the Site; local authorities will be familiarized with Site operations.	These requirements are relevant and appropriate to operations at the groundwater treatment facility. Although the GWTP does not treat RCRA-designated hazardous waste, it does generate a treatment residual that may, at times, meet the definition of a RCRA hazardous waste. Generator requirements are therefore being complied with at the facility. Local authorities are familiar with Site operations and safety equipment is in place.

TABLE A7-4. POTENTIAL ACTION-SPECIFIC ARARS FOR OPERABLE UNITS 1 AND 2 BAIRD & MCGUIRE SITE, HOLBROOK, MASSACHUSETTS

ARAR	REQUIREMENT SYNOPSIS AND STATUS	ACTION TAKEN TO ATTAIN ARARS	FIVE-YEAR REVIEW
RCRA – Contingency Plan and Emergency Procedures (40 CFR 265.50-265.56)	This regulation outlines the requirements for emergency procedures to be used following explosions, fires, etc. This regulation also requires that threats to public health and the environment be minimized. **ROD Status: ARAR** **5-Year Status: Relevant and Appropriate**	Plans will be developed and implemented during Site work including installation of monitoring wells, and implementation of Site remedies. Copies of the plans will be kept on-site.	These requirements are relevant and appropriate to operations at the groundwater treatment facility. Although the GWTP does not treat RCRA-designated hazardous waste, it does generate a treatment residual that may, at times, meet the definition of a RCRA hazardous waste. Generator requirements are therefore being complied with at the facility. A contingency plan is available at the Site.
RCRA Subpart F – Groundwater Protection (40 CFR 264.90-264.109)	This regulation details requirements for a groundwater monitoring program to be installed at the Site. **ROD Status: ARAR** **5-Year Status: Relevant and Appropriate**	A groundwater monitoring system must be installed as part of any alternative. During Site characterization, the location and depth of monitoring wells will be evaluated for use in this monitoring program.	Groundwater corrective action rules have changed significantly since the ROD was issued. A groundwater monitoring program has been implemented at the Site. Monthly water level monitoring and quarterly groundwater sampling is performed under this plan. These requirements are relevant and appropriate to the Site due to its former use. Substantive rules are being complied with.
RCRA Subpart G – Closure and Post-Closure (40 CFR 264.110-264.120)	This regulation details specific requirements for closure and post-closure of hazardous waste facilities. **ROD Status: ARAR** **5-Year Status: Not ARAR**	Those parts of the regulations concerned with long-term monitoring and maintenance of the Site will be considered during remedial design. A post-closure plan will be developed.	These requirements were relevant and appropriate to the incinerator. The incinerator has been dismantled. The groundwater treatment facility does not treat hazardous waste and does not meet the standards for being sufficiently similar to a hazardous waste treatment facility. These rules are no longer considered applicable, relevant or appropriate.

TABLE A7-4. POTENTIAL ACTION-SPECIFIC ARARS FOR OPERABLE UNITS 1 AND 2 BAIRD & MCGUIRE SITE, HOLBROOK, MASSACHUSETTS

ARAR	REQUIREMENT SYNOPSIS AND STATUS	ACTION TAKEN TO ATTAIN ARARS	FIVE-YEAR REVIEW
RCRA Subpart K – Surface Impoundments (264.220 – 264.232)	This regulation specifies design, operation and closure requirements for surface impoundments containing hazardous waste. **ROD Status: ARAR** **5-Year Status: Not ARAR**	Design and operating requirements for a liner, leachate collection and removal system and closure are detailed.	There are no waste impoundments on-site. These rules are not applicable, relevant or appropriate.
RCRA Subpart N – Landfills (40 CFR (264.300 – 264.317)	This regulation details design and operating, monitoring, closure and post-closure requirements for hazardous waste landfills. **ROD Status: ARAR** **5-Year Status: Not ARAR**	Landfills must be designed with a liner leachate collection and monitoring, and a specific cap. In addition, long-term monitoring and a post-closure plan must be developed.	As RCRA Subtitle C hazardous wastes were not land disposed on-site, these rules are not applicable, relevant or appropriate.
RCRA Subpart O – Incinerators (40 CFR 264.340 – 264.351)	This regulation details specific requirements for the design, operation and closure of a hazardous waste incinerator. **ROD Status: ARAR** **5-Year Status: Not ARAR**	Performance standards, waste analysis, operating requirements, monitoring, inspection and closure are specified.	These requirements were relevant and appropriate to the incinerator. The incinerator has been dismantled. The groundwater treatment facility does not treat hazardous waste and does not meet the standards for being sufficiently similar to a hazardous waste treatment facility. These rules are no longer considered applicable, relevant or appropriate.

TABLE A7-4. POTENTIAL ACTION-SPECIFIC ARARS FOR OPERABLE UNITS 1 AND 2 BAIRD & MCGUIRE SITE, HOLBROOK, MASSACHUSETTS

ARAR	REQUIREMENT SYNOPSIS AND STATUS	ACTION TAKEN TO ATTAIN ARARS	FIVE-YEAR REVIEW
Clean Water Act – Surface Water Discharges (40 CFR Parts 122, 125)	Any point source discharges must meet NPDES permitting requirements, which include compliance with applicable water quality standards; establishment of a discharge monitoring system; and routine completion of discharge monitoring records. **ROD Status: ARAR** **5-Year Status: Not ARAR**	If groundwater that has been treated by on-site treatment processes is discharged to surface waters on-site, treated groundwater must be in compliance with applicable water quality standards. In addition, a discharge monitoring program must be implemented. Routine discharge monitoring records must be completed.	Treated groundwater is being discharged back to groundwater. No direct, point-source surface water discharge is occurring.
CWA – 40 CFR Part 230	This regulation outlines requirements for discharges of dredged or fill material. Under this requirement no activity that impacts a wetland will be permitted if a practicable alternative that has less impact on the wetland is available. If there is no other practicable alternative, impacts must be mitigated. **ROD Status: ARAR** **5-Year Status: Applicable**	During the identification, screening, and evaluation of alternatives, the effects on wetlands must be evaluated.	A Wetlands Restoration Plan has been implemented at the Site.
CAA – NAAQS for Total Suspended Particulates (40 CFR 129.105, 50)	This regulation specifies maximum primary and secondary 24-hour concentrations for particulate matter. **ROD Status: ARAR** **5-Year Status: Not ARAR**	Fugitive dust emissions from Site excavation activities will be maintained below 260 $\mu g/m^3$ (primary standard) by dust suppressants, if necessary.	These requirements were applicable to the excavation and incineration of debris. These activities are completed. These requirements are only applicable if further land disturbing activities are conducted. None are currently planned.

TABLE A7-4. POTENTIAL ACTION-SPECIFIC ARARS FOR OPERABLE UNITS 1 AND 2 BAIRD & MCGUIRE SITE, HOLBROOK, MASSACHUSETTS

ARAR	REQUIREMENT SYNOPSIS AND STATUS	ACTION TAKEN TO ATTAIN ARARS	FIVE-YEAR REVIEW
DOT Rules for Transportation of Hazardous Materials (49 CFR Parts 107, 171.1-171.5)	This regulation outlines procedures for the packaging, labeling, manifesting, and transportation of hazardous materials. **ROD Status: ARAR** **5-Year Status: Not ARAR**	Contaminated materials shipped off-site will be packaged, manifested, and transported to a licensed off-site disposal facility in compliance with these regulations.	Shipping of hazardous materials has been in compliance. EPA no longer considers DOT rules an ARAR as they are not environmental rules and must always be complied with for all off-site shipments.
State Regulatory Requirements			
Massachusetts Hazardous Waste Regulations (310 CMR 30.000, MGL Ch. 21C)	These regulations provide a comprehensive program for the handling, storage, and recordkeeping at hazardous waste facilities. They implement federal RCRA regulations. **ROD Status: ARAR** **5-Year Status: Relevant and Appropriate**	Because these requirements supplement RCRA hazardous waste regulations, they must also be considered at the Site.	These requirements are relevant and appropriate to operations at the groundwater treatment facility. Although the GWTP does not treat RCRA-designated hazardous waste, it does generate a treatment residual that may, at times, meet the definition of an RCRA hazardous waste. Generator requirements are therefore being complied with at the facility.
Massachusetts Solid Waste Management regulations (310 CMR 19.141)	This regulation requires that notice be recorded in the Registry of Deeds whenever certain types of solid or hazardous waste activity occur on property. **ROD Status: ARAR** **5-Year Status: Applicable**	Notification of remedial actions will be given to the County Registry of Deeds.	This has not been completed to date.

TABLE A7-4. POTENTIAL ACTION-SPECIFIC ARARS FOR OPERABLE UNITS 1 AND 2 BAIRD & MCGUIRE SITE, HOLBROOK, MASSACHUSETTS

ARAR	REQUIREMENT SYNOPSIS AND STATUS	ACTION TAKEN TO ATTAIN ARARS	FIVE-YEAR REVIEW
Massachusetts Wetlands Protection (310 CMR 10.00)	This regulation outlines the requirements necessary to work within 100 feet of a coastal or inland wetland. The act sets forth a public review and decision-making process by which activities affecting waters of the state are to be regulated to contribute to their protection. **ROD Status: ARAR** **5-Year Status: Applicable**	Wetland remediation will comply with the substantive but not the administrative requirements for wetland protection.	To mitigate unavoidable wetland impacts, a Final Site Restoration Plan was developed. The plan required the restoration of forested and scrub/shrub floodplain wetlands, including a small peat bog, and an intermittent stream impacted by the remedial action. The plan also required annual monitoring of the wetlands for at least three years following completion of the restoration efforts. Four years of monitoring data were collected and the final monitoring report was completed in 2002.
Massachusetts Surface Water Discharge Permit Program (314 CMR 2.00-4.00)	This section outlines the requirements for obtaining an NPDES permit in Massachusetts. **ROD Status: ARAR** **5-Year Status: Not ARAR**	Pollutant discharges to surface water must comply with NPDES permit requirements. Permit conditions and standards for different classes of water are specified.	No direct point-source discharges to surface water are occurring.
Certification for Dredging, Dredged Material Disposal, and Filling Waters (314 CMR 9.00, MGL Ch. 21, ss. 26-53)	This regulation is promulgated to establish procedures, criteria, and standards for the water quality certification of dredging and dredged material disposal. **ROD Status: ARAR** **5-Year Status: Applicable**	Applications for proposed dredging/fill work need to be submitted and approved before work commences. Three categories have been established for dredge or fill material based on the chemical constituents. Approved methods for dredging, handling, and disposal options for the three categories must be met.	To mitigate unavoidable wetland impacts, a Final Site Restoration Plan was developed. The plan required the restoration of forested and scrub/shrub floodplain wetlands, including a small peat bog, and an intermittent stream impacted by the remedial action. The plan also required annual monitoring of the wetlands for at least three years following completion of the restoration efforts. Four years of monitoring data were collected and the final monitoring report was completed in 2002.

TABLE A7-5. POTENTIAL CHEMICAL-SPECIFIC CRITERIA, ADVISORIES, AND GUIDANCE FOR OU-3. BAIRD & MCGUIRE SITE, HOLBROOK, MASSACHUSETTS

MEDIA AND AUTHORITY	REQUIREMENT	ROD STATUS	ROD REQUIREMENT SYNOPSIS AND CONSIDERATION IN THE FFS	FIVE-YEAR REVIEW
Surface Water				
Federal Regulatory Requirements	SDWA – MCLs (40 CFR 141.11 – 141.16)	Relevant and Appropriate	Maximum contaminant levels (MCLs) have been promulgated for a number of common organic and inorganic contaminants. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered relevant and appropriate for surface water bodies used for drinking water. When the risks to public health due to consumption of surface water were assessed, concentrations of contaminants of concern were compared to federal MCLs.	MCLs and non-zero MCLGs have the status of ARARs for surface water downgradient of the Baird & McGuire Site boundaries. Many of the MCLs and MCLGs have changed since ROD completion. MCLs/MCLGs for site contaminants are provided in Table A7-2. Contaminated sediments have been removed and are no longer expected to leach contamination to the Cochato River. This requirement has been attained for OU-3. These criteria are not currently ARAR; however, they may become relevant and appropriate if the Cochato River is considered for a potential public water supply.
	SDWA – MCLGs (40 CFR 141.50 – 141.51)	Relevant and Appropriate	MCLGs are health-based criteria that are used for the protection of drinking water sources as a result of SARA. These unenforceable goals are available for a number of organic and inorganic contaminants. MCLGs will be used when an extraordinary risk is associated with contaminants in the Cochato River surface water and sediment.	MCLs and non-zero MCLGs have the status of ARARs for surface water downgradient of the Baird & McGuire Site boundaries. Zero MCLGs are criteria to be considered. Many of the MCLs and MCLGs have changed since ROD completion. MCLs/MCLGs for site contaminants are provided in Table A7-2. Contaminated sediments have been removed and are no longer expected to leach contamination to the Cochato River. This requirement has been attained for OU-3. It would be relevant and appropriate if the Cochato River is considered for a potential public water supply.

TABLE A7-5. POTENTIAL CHEMICAL-SPECIFIC CRITERIA, ADVISORIES, AND GUIDANCE FOR OU-3. BAIRD & MCGUIRE SITE, HOLBROOK, MASSACHUSETTS

MEDIA AND AUTHORITY	REQUIREMENT	ROD STATUS	ROD REQUIREMENT SYNOPSIS AND CONSIDERATION IN THE FFS	FIVE-YEAR REVIEW
	Federal Ambient Water Quality Criteria (AWQC) under the Clean Water Act	Relevant and Appropriate	Remedial actions involving contaminated surface water or groundwater must consider the uses of the water and the circumstances of the release or threatened release; this determines the relevance and appropriateness. This requirement will be considered when determining clean-up levels or potential discharge limits.	CERCLA Sec. 121 (d)(2)(A) Specifically states that remedial actions shall at least attain federal AWQC established under the Clean Water Act if they are relevant and appropriate. These criteria are not currently ARAR; however, they may become relevant and appropriate if the Cochato River is considered for a potential public water supply. Current AWQC are listed in Table A7-6.
State Regulatory Requirements	Massachusetts Drinking Water Standards (310 CMR 22.00)	Relevant and Appropriate	Massachusetts adopted the federal SDWA Maximum Contaminant Levels (MCLs) as its drinking water standards. MCLs regulate the concentration of contaminants in public drinking water supplies. When risks to public health due to consumption of surface water were assessed, concentrations of contaminants of concern were compared to Massachusetts MCLs.	The Site is located in a designated Mass. Wellhead Protection Area. Drinking water standards are applicable to drinking water sources surrounding the Baird & McGuire Site. MMCLs for site contaminants are provided in Table A7-2. Contaminated sediments have been removed and are no longer expected to leach contamination to the Cochato River. This requirement has been attained for OU-3. It does, however, remain relevant and appropriate.
	Massachusetts Surface Water Quality Standards (314 CMR 4.00)	Applicable	Surface water quality standards are specified for the major surface water bodies of the Commonwealth. Surface waters were classified with respect to designated uses. Each class of surface water has a criteria associated with it (e.g., dissolved oxygen, temperature, pH, total coliform). The Cochato River is designated as a Class B River. Actions will take into account the designated use(s) and will comply with specified water quality standards.	These regulations classify the surface waters of the Commonwealth according to the uses of those waters. The wetland has a Class A waterway classification. Class A waters are designated as habitat for fish, other aquatic and wildlife, and for primary and secondary contact recreation. The state surface water minimum criteria for Class A waters are consistent with federal AWQC. These rules are applicable to the Cochato River and unnamed brook.

TABLE A7-5. POTENTIAL CHEMICAL-SPECIFIC CRITERIA, ADVISORIES, AND GUIDANCE FOR OU-3. BAIRD & MCGUIRE SITE, HOLBROOK, MASSACHUSETTS

MEDIA AND AUTHORITY	REQUIREMENT	ROD STATUS	ROD REQUIREMENT SYNOPSIS AND CONSIDERATION IN THE FFS	FIVE-YEAR REVIEW
Air				
State Regulatory Requirements	Massachusetts Air Pollution Control Regulations (310 CMR 6.04)	Relevant and Appropriate	Massachusetts has promulgated ambient air quality standards for six pollutants (e.g., sulfur oxides, particulate matter, carbon, ozone, nitrogen, and lead). During excavation activities these standards will be complied with.	310 CMR 6.00 provide ambient air quality standards for the Commonwealth, standards for dust are contained in 310 CMR 7.09, and 310 CMR 7.08 provides incinerator standards. These standards were used in establishing discharge limits from the incinerator. The incinerator has been dismantled and these requirements are no longer applicable, relevant or appropriate. Should excavation occur in the future, dust control standards would need to be reconsidered.
Federal Criteria, Advisories, and Guidance	EPA Office of Water Guidance, Water-Related Fate of 129 Priority Pollutants (1979).	To Be Considered	This guidance manual gives transport and fate information for 129 priority pollutants. These criteria were considered during the risk assessment.	There is no change from the ROD presentation for this ARAR.
State Criteria, Advisories and Guidance	Massachusetts Guidance on Allowable Ambient Levels (AALs), cited in Chemical Health Effects Assessment Methodology and Methodology to Derive Allowable Ambient Levels. Draft, DEQE, 1987.	To Be Considered	This guidance evaluates acute and chronic toxicity and sets draft AALs for 106 chemicals. Final AALs will be issued in 1989. These levels will be considered when evaluating excavation and treatment technologies that have potential hazardous air emissions.	These requirements are no longer to be considered for this operable unit. The incinerator has been dismantled.

TABLE A7-5. POTENTIAL CHEMICAL-SPECIFIC CRITERIA, ADVISORIES, AND GUIDANCE FOR OU-3. BAIRD & MCGUIRE SITE, HOLBROOK, MASSACHUSETTS

MEDIA AND AUTHORITY	REQUIREMENT	ROD STATUS	ROD REQUIREMENT SYNOPSIS AND CONSIDERATION IN THE FFS	FIVE-YEAR REVIEW
Soil/Sediment				
Federal Criteria, Advisories and Guidance	EPA Future Interim Sediment Criteria Values for Nonpolar Hydrophobic Organic Contaminants (SCD No. 17; May 1988)	To Be Considered	These criteria have been recently developed by EPA for 16 organic compounds. These criteria represent levels protective of aquatic life. These criteria were used to generate sediment quality criteria values during the risk assessment.	These criteria were never finalized and are no longer used, having been replaced by other, more appropriate criteria such as EPA *Ecotox Thresholds and Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario*. These criteria are no longer to be considered. See Table A7-6 for the replacement criteria which are to be considered during risk evaluation of sediment.
State Regulatory Requirements	Soil Standards for S-3 (310 CMR 40.0975(6)(c)	Applicable	The MCP establishes requirements and procedures for the discovery, notification, assessment of, and responses to, releases and threats of release of oil or hazardous materials. Pursuant to MCL c21E and the MCP, the Commonwealth of Massachusetts publishes a list of confirmed oil or hazardous material to be investigated. Because the Baird & McGuire Site is a confirmed state hazardous material Site and listed on the National Priorities List, joint federal and state jurisdiction exists. Cooperative agreements and contracts with the federal government shall incorporate, to the extent possible, the deadlines and specifications of MCL c21E and the MCP.	The MCP includes a specific reference to remediation at CERCLA sites (40.0111) where it is stated that the MCP does not apply to sites adequately regulated under CERCLA, provided that DEP concurs with the ROD and that CERCLA addresses all contaminants. DEP concurred with the ROD for this site. Therefore, these rules are no longer considered ARARS.

TABLE A7-6. NUMERICAL CHEMICAL-SPECIFIC ARARS CRITERIA, ADVISORIES, AND GUIDANCE FOR CONTAMINANTS OF CONCERN FOR OU-3 BAIRD & MCGUIRE SITE, HOLBROOK, MASSACHUSETTS

CHEMICAL OF CONCERN	Surface Water		Sediment	
	Water Quality Guideline (µg/l)	Source[1]	Sediment Quality Guideline(mg /kg)	Source[2]
Organic Compounds:				
Acenapthalene	--	--	0.044	ER-L
Benzene	46	ET Tier II	0.057	SQB
Chlordane	0.0043	AWQC	0.00324	TEC
DDT (4,4'-)	0.001	AWQC	0.00416	TEC
Di(2-ethylhexyl)phthalate (DEHP)	32	ET Tier II	--	--
Dibenzofuran	20	ET Tier II	2	SQB
Dichloroethylene, 1,2-trans	590	SCV	--	--
Dichloromethane (Methylene chloride)	2200	SCV	--	--
Dieldrin	0.056	AWQC	0.0019	TEC
Dimethylphenol, 2,4-	---	--	--	--
Ethylbenzene	290	ET Tier II	3.6	SQC
Fluorene	3.9	ET Tier II	0.0774	TEC
Methylnaphthalene, 2-	330	Region V	0.070	ER-L
Methylphenol, 4-	--	--	--	--
Monochlorobenzene	130	ET Tier II	0.82	SQB
Naphthalene	24	ET Tier II	0.176	TEC
PAHs[(3)]	--	--	1.61	TEC
Toluene	130	ET Tier II	0.67	SQB
Trichloroethane, 1,1,1-	62	ET Tier II	0.17	SQB
Trichloroethylene (TCE)	350	ET Tier II	1.6	SQB
Xylenes (total)	13	SCV	0.025[4]	SQB
Inorganics:				
Arsenic	150[5]	AWQC	9.79	TEC
Lead	2.5[5]	AWQC	35.8	TEC

NOTES:

[1] Current surface water quality guidelines were selected based on the following hierarchy:

1) EPA National Recommended Water Quality Criteria (AWQC) (EPA, 2006)

2) EPA Ecotox Thresholds (ET TIER II) for Surface Water (EPA, 1996)

3) Secondary Chronic Values (SCVs) for aquatic biota developed by Oak Ridge National Laboratory (Suter and Tsao, 1996)

4) Region V screening levels. US EPA Region V Ecological Screening Levels (EPA, 2003) at http://www.epa.gov/reg5rcra/ca/edql.htm

[2] Current sediment quality guidelines were selected based on the following hierarchy:

1) Consensus-based Threshold Effects Concentrations (TEC) for sediments (MacDonald et al., 2000)

2) EPA Ecotox Thresholds for Sediment (EPA, 1996). Citation for both EPA Sediment Quality benchmarks by equilibrium partitioning (SQB) or EPA Sediment Quality Criteria (SQC).

3) National Oceanic and Atmospheric Administration (NOAA) Effects Range –Low (ER-L) for sediments (Long & Morgan, 1990; Long *et al.* 1995; *respectively cited in* Jones, Suter & Hull, 1997)

[3] Polycyclic Aromatic Hydrocarbons. Sediment quality guidelines are for total PAH

[4] Sediment quality criteria for Xylenes is for m-Xylene

[5] Hardness dependent